HARD HABITS TO BREAK

Investigating Coastal Resource Utilisations and Management Systems in Sulawesi, Indonesia

A Thesis

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Personal dedications:

To my late father, **H.M. Idrus R.Y**,
and my late father in law **Andi M. Arsyad**,
the two people whom I have drawn lots of learning from.

To my mother, **H. Rusdianah Day**,
thank you for all your patience
especially in waiting for 10 years to hear this news

To my wife, **Andi Ira Tenrisanna Herawaty**,
thank you for supporting me all along,
we still have a lot more works ahead

To my sons, **Ikram** and **Rayhan**,
thank you for bringing all those happiness
we have faith in your future

ABSTRACT

HARD HABITS TO BREAK: INVESTIGATING COASTAL RESOURCE UTILISATION AND MANAGEMENT SYSTEMS IN SULAWESI, INDONESIA

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This research investigates the paradox that many coastal communities in developing countries are resource rich but income poor. Another aspect of this paradox is the belief that local communities possess traditional knowledge that respects nature. This belief contrasts the fact that major tropical coastal ecosystems, namely coral reefs and mangroves, are being destroyed at rapid and increasing rates, in many cases by the people whose livelihoods depend on them.

These paradoxical circumstances lead to a central question: if the sustainability of coastal resources is vital for the livelihood of local communities, why are these resources being degraded, often to the point of complete destruction? This study explores the motives and consequences of destructive methods of coastal resource utilisation and examines the potential for sustainable livelihoods based on coastal resources currently under threat from destructive use patterns. The analysis is based on a field study conducted in 2006 and 2008 in eleven sites around the island of Sulawesi, Indonesia. This area is characterised by great biodiversity, including one of the highest marine biodiversities in the Asia-Pacific region.

Coral and mangrove ecosystem resource use was found to be driven by different processes and activities; hence the destructive practices impacting both ecosystems were also different. Blast and poison fishing were the most widespread destructive resource use methods found for coral reefs whereas large-scale habitat conversion was responsible for mangrove ecosystem reduction. In the field both resources were found to be under enormous anthropogenic pressures, with published data suggesting that only 5.8% of Indonesian coral reefs are currently in excellent condition and only 38% of mangrove cover remaining in Sulawesi relative to that of 25 years ago. The dynamics of these coastal resources, and of their destruction, are classic examples of the 'tragedy of the commons'.

Research findings further indicate that formal institutions tasked with managing these resources have not been able to promote their effective conservation. An array of competing demands and conflicting interests, coupled with inefficient institutional arrangements and under-investment, have rendered inadequate many resource management efforts, including the externally-imposed concepts, allowing destructive patterns of resource utilization to persist. Local communities are disempowered when confronted with (1) the intricate network of destructive-fishing actors targeting coral reefs, or (2) large company-government bureaucracy collusions allowing mangrove conversion. The existence of this collusive network must be considered in any effort to address problems of effective management.

Empirical insights suggest that conservation at local level has to face the challenges of market-driven resource extraction at a global scale. Only when a coastal community manages to overcome the dilemma in managing common-pool resource, conservation measures can be implemented and a degree of sustainability attained. Findings from this research have important implications for the discourses on coastal resource policy and research. This research advances the discussions to the area where the core of conflict of interests among stakeholders took place, and yet has rarely been addressed previously. The synthesis from this study provides a strong basis to understand the nature of asymmetric relations amongst the resource stakeholders, and therefore will help in generating effective policies for a fairer coastal resource management regime.

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GLOSSARY

ADB	Asian Development Bank
ANFO	Home-made bombs used to catch fish are constructed from kerosene and ammonium nitrate fertilizer in bottles. This type of bombs is also known as ANFO (ammonium nitrate/fuel oil) bombs.
BAPPEDA	Regional or District Development Planning Agency (*Badan Perencanaan Pembangunan Daerah*).
BPS	Indonesian Central Bureau of Statistic (*Biro Pusat Statistik*)
Bubu	The bubu trap is a very traditional method of fishing by replacing a section of corals with a trap. This is used to capture bottom dwelling species such as crabs and *ciganideae* fishes
CCRR – Unhas	Hasanuddin University's Centre for Coral Reef Research
COREMAP	Coral Reef Rehabilitation and Management Programme
CRMP	Coastal Resource Management Project
CPR	Common Pool Resources
DFP	Destructive Fishing Practices, can be defined as any activity that results in direct damage to either the fished habitat or the primary habitat-structuring organisms where the fishing took place.
DUMP	Destructive (Resource) Utilisation Methods and Practices
FGD	Focus Group Discussion
ICM, also ICZM	Integrated Coastal (Zone) Management
IDR	Indonesian currency, the Rupiah.

Law 23 of 1997	Environmental Management Act, a substitute to the older version of Law 12 of 1984.
Law 27 of 2007	Act for the management of coastal areas and small islands.
Law 31 of 2004	Fisheries Act, a substitute to the earlier Law 9 of 1985.
Law 32 of 2004	Autonomy Act, the basis for decentralisation policy. This is a substitute to the earlier Law 22 of 1999.
Law 33 of 2004	Financial distribution Act, concerning with fair distribution of financial revenue from natural resources, and shared responsibilities between central and local governments. A substitute to the earlier Law 25 of 1999.
MCRMP	Marine and Coastal Resource Management Project
MMAF	Ministry of Marine Affairs and Fisheries
MPA	Marine Protected Area
MREP	Marine Resource Evaluation Project
Muroami	A low efficiency method borrowed from the Japanese that involves fishers standing at points holding a weighted net close in to the beach into which fish are herded or “scared” and surrounded
NGO	Non-governmental Organisation
OTODA	*Otonomi Daerah* (Regional Autonomy Policy)
Patron-Client	A patron-client relationship is an informal institution that serves as a social arrangement to maintain and protect livelihood security involving an asymmetric relation between a local leader (patron) and his workers/subordinates (clients).
Ponggawa-sawi	The *Ponggawa* is a patron who finances his own fishing enterprise, and recruits members of his own ethnic group or village to work as labourers. Meanwhile, the *Sawi*s are the people who work as labourers for the *ponggawa*. The *ponggawa-sawi* social arrangement has a long history in both the fishing and the agricultural communities in Sulawesi

Reformasi	Indonesian word for reform, it becomes a name for a new era, started in 1998 marked by the collapse of Suharto's authoritarian regime, and the beginning of a new social and political reform.
SLA	Sustainable Livelihood Analysis

PART 1. INTRODUCTION AND CONTEXT

CHAPTER I. INTRODUCTION

1.1. BACKGROUND AND OVERVIEW OF THE RESEARCH

This thesis is about the use of coral reefs and mangroves in the changing situation of Indonesia. It is an insight into the dynamic couplings of human and natural aspects of coastal resource systems, and is intended to help in improving the decision making process and policies affecting coastal communities. The research on which this thesis is based is an exploration in the field of the motives and consequences of methods of coastal resource utilisation, and an examination of the potential for sustainable livelihoods from coastal resources under threat of destructive use patterns.

To this end, this research investigates the paradox that many coastal communities in developing countries are resource rich but income poor. In Indonesia, on the one hand coastal areas are rich in natural resources, yet on the other hand coastal communities, especially fishing communities, are among the poorest people in the country. Another aspect of this paradox is the belief that local communities possess traditional knowledge of and respect for nature, placing environmental conservation above all else. This belief contrasts with the fact that major tropical coastal ecosystems, namely coral reefs and mangroves, are being destroyed at rapid and increasing rates, in many cases by the people whose livelihoods depend on them. These paradoxical circumstances therefore lead me to the central question of my research: if the sustainability of coastal resources is vital for the livelihood of local communities, why are these resources being continuously degraded, often to the point of complete destruction?

My interest to this subject derived from my past experience of working in coastal areas. This research was therefore meant to explore further the theoretical underpinnings and philosophical background to the practical matters I have encountered and picked up along the way. By the time of writing this thesis, my exposure to the theoretical as well as practical aspects of tropical marine and coastal resources has reached a time span of two decades. During this timeline the learning process has never stopped. There were times spent accumulating cognitive

information about these ecosystems and the resources embedded in them, and there were times used to build a good rapport with coastal communities, and practical ways of working. Needless to say, my learning curve during that time has necessarily been non-linear, as such that it represents the process of my growth as an academic, a natural resource management practitioner, and more particularly as the person I am now.

As I started my undergraduate study in Fishery Science in the mid-1980s, I was exposed to a series of teachings about the richness of Indonesian marine resources and the extent of their potential. As students, we went to the field, and spent long nights on the beach measuring tide, current and wave movements. We became convinced of the abundant of resources located within these ecosystems.

I graduated with a bachelor degree in aquaculture. For the next two years, I worked as a field manager for a shrimp cultivation company. Although the company was often seen as the big capitalist from outside that came to exploit local resources, I got along quite well personally with the local community which was the source for labour working the shrimp farms. Little did I know that I was part of a business operation that with hindsight would later leave behind problems detrimental to the local environment as well as to the local community's livelihoods.

I did not work long enough to see the collapse of the company. Instead, I left when it was experiencing high levels of production. I left the company in 1991 in order to join the recruitment of lecturers at my hometown university where I had done my undergraduate study, the Hasanuddin University. I was among the select few who were lucky enough to join the lecturing staff of the Department of Marine Science, a newly created department which was built on the premise of the increasing need to study the abundant resources and the big potential of the Indonesian sea.

Soon after joining the university, I got a chance to continue my studies, for a masters degree at McGill University, Canada. Again, while majoring on aquatic ecology here, I was exposed to indisputable data and information about the richness of tropical marine ecosystems like Indonesia. It was there in Montreal, thanks to the wide ranging background of post graduate students that I came to know and learned with, that I started my interest in social- and political economic aspects of natural resource management.

Coming back into Hasanuddin University campus as a lecturer, I often took my students out to the field, especially to the small islands close to mainland Sulawesi

where a few dozen scattered small islands make up the Spermonde Archipelago. I wanted them to experience first hand the life in the islands and to see these things with their own eyes. To foreign eyes, these islands –with their white long sandy beaches and strokes of daily sunlight- are paradise. The grim reality of local community livelihood however, tells the opposite. Indeed, survival in coastal communities in Indonesia has never been easy. It represents hard work, struggles, uncertainties, unsustainable income, and poverty.

The paradox of "rich sea – poor people", mentioned above, have been the main theme of my concern, academically as well as in practice. In addition, the widespread occurrence of Destructive Utilisation Methods and Practices (DUMP), such as blast fishing and mangrove habitat conversion, in Indonesia but more specifically within the Sulawesi region, has heightened this concern. How can I understand the complexities that lie behind these practices and how can I explain the rationale used to justify them? It is my personal endeavour to find the answer to such issues, as well as to lay a path to resolve the problems they pose.

From a broader perspective, this research is an attempt to provide an appropriate approach to responding to the developmental challenges faced by developing countries in managing their coastal resources. Such an approach is crucial in a setting where society faces a wave of economic hardship, while – as in Indonesia - the state is beginning to transform its institutional arrangements and socio-political structures.

1.2. RATIONALE OF THE RESEARCH

Indonesia is the world's largest archipelagic nation and is endowed with highly diverse marine resources, coastal communities, culture, and customs (Sloan and Sugandhy, 1994; Dahuri, 2003; Dutton, 2004). Like many other developing nations, Indonesia's model of development is one which relies heavily on a rich natural resource base for generating economic wealth and enhancing the living standards of its people. While there has been apparent success in poverty alleviation, the national development program has been criticised for its pressure to exploit resources (Salim, 1982; Dahuri *et al*, 1996; Hill, 2000 and Dutton, 2004). Indeed, natural resources have played such a central role in Indonesian economic development that many of its resource bases have been depleted and their sustainability is undermined.

The products and services that come from coastal and marine ecosystems are crucial to people's livelihoods. It is estimated that marine and coastal economic activities accommodated 13.6 million jobs or 16.2% of the entire national labour force in 2005 (GoI, 2007). Approximately 22% of Indonesia's GNP comes from coastal and marine areas through fishing, aquaculture, mining, forestry, transportation, tourism and other industries (Dahuri, 2003). As population numbers and development intensity will inevitably increase and, at the same time, terrestrial resources decline or are deemed difficult to develop, coastal and marine resources will continue to be a primary means of underwriting sustainable economic development.

Despite the important role of coastal and marine ecosystems to the Indonesian economy and life, there is accumulating evidence of environmental problems in many coastal areas. Indonesia's coastal regions at present are under increasing pressure from incompatible development activities compounded by a burgeoning population. Significant deterioration of the coastal environment is evident, especially in some of the biosphere's most productive natural ecosystems such as mangrove forests, coral reefs and estuaries. The situation is worsened by the increasing level of pollution that comes along with the intensification of development activities. In many coastal waters, particularly those adjacent to urban or densely-populated areas, the level of pollution has significantly exceeded allowable environmental standards (Resosudarmo *et al*., 2000 and Dutton, 2004). Even more worrying is the rampant and widespread practice of destructive methods in resource utilisation, such as destructive fishing using bombs or poison, and clear felling of mangrove forests for conversion of the habitat into industrial uses.

While the explanation for such developmental failures is ultimately complex, at a superficial level planning mechanisms have failed to take into account the long-term impact of development. This is mainly due to the sectoral mode of development planning that took place previously (Tobin, 1992; Dahuri, 2003; and Tacconi, 2007). Although coastal areas are known to be highly populated with a multitude of conflicting interests laid upon them, institutions responsible for managing the multiple uses of coastal and marine resources have often been caught in their own webs of complex coordination and without capacity to respond to the intricate problems. If such a trend of degradation of coastal and marine ecosystems continues, it will be difficult for Indonesia to pursue optimal utilisation of its coastal and marine wealth for the country's sustainable economic development.

It is, therefore, timely to reconsider the development paradigm and practices currently in-place with regard to coastal and marine resources in Indonesia. A shift in development paradigm, from a short-term orientation towards economic growth to a better balance of economic, ecological and social objectives (aptly known as sustainable development) is needed. The crucial challenge for managing Indonesian coastal resources now is how to strive for economic development by utilising invaluable natural resources without undermining ecosystem sustainability. It is, in simpler terms, a question of how to implement the sustainable development paradigm into practices of coastal and marine development.

It is in this spirit that this research was conducted. Using the coastal areas of the Sulawesi Island in Indonesia as study sites (Figure 4.1), it investigates the nature and role of sustainable development approaches in managing coastal resources; examines the practice of destructive methods in coastal resource utilisations; and attempts to address the multi-faceted interests in these resources. The outcomes of this research provide insights into the dynamic couplings of human and natural aspects of coastal resource systems and, as such, are intended to help improve the decision making process and policies affecting coastal communities in developing nations.

1.3. OVERVIEW OF INDONESIAN MARINE RESOURCES

Marine ecosystems are the lifeblood of planet earth. From the life-giving rain which nourishes crops to life saving medicines; from the fish that come from the ocean waters to the global goods which are transported on the sea's surface, the ocean plays a crucial role in human life. This is especially true for Indonesia where marine waters cover more than two thirds of its total territory. With nearly 6 million km^2, equivalent to 2% of the world's ocean surface, under Indonesia's jurisdiction, oceans are undeniably an important part of Indonesian life (Figure 1).

Indonesia stretches along the equator from $6^o08'$ north to $11^o15'$ south latitude and from $94^o45'$ to $141^o05'$ east longitude, a distance of some 5,150 km from east to west. In the other direction, the distance is 1,930 km from north to south (GoI, 2007). More than 70% of Indonesia's national jurisdiction is sea area, naturally configured within 81,000 km straight baselines encircling the whole archipelago (Tomascik et al., 1997). The total area of 7,892,350 km^2 of land and sea can further be broken down as

follows: a land area of 1.92 million km^2; archipelagic waters and a 12-mile territorial sea comprising 3.2 million km^2; and a 200-mile Exclusive Economic Zone (EEZ) of 2.7 million km^2 (Tomascik et al., 1997; Kusuma-Atmadja and Purwaka, 1996). Table 1 presents the geographic summary of this world's largest archipelagic state.

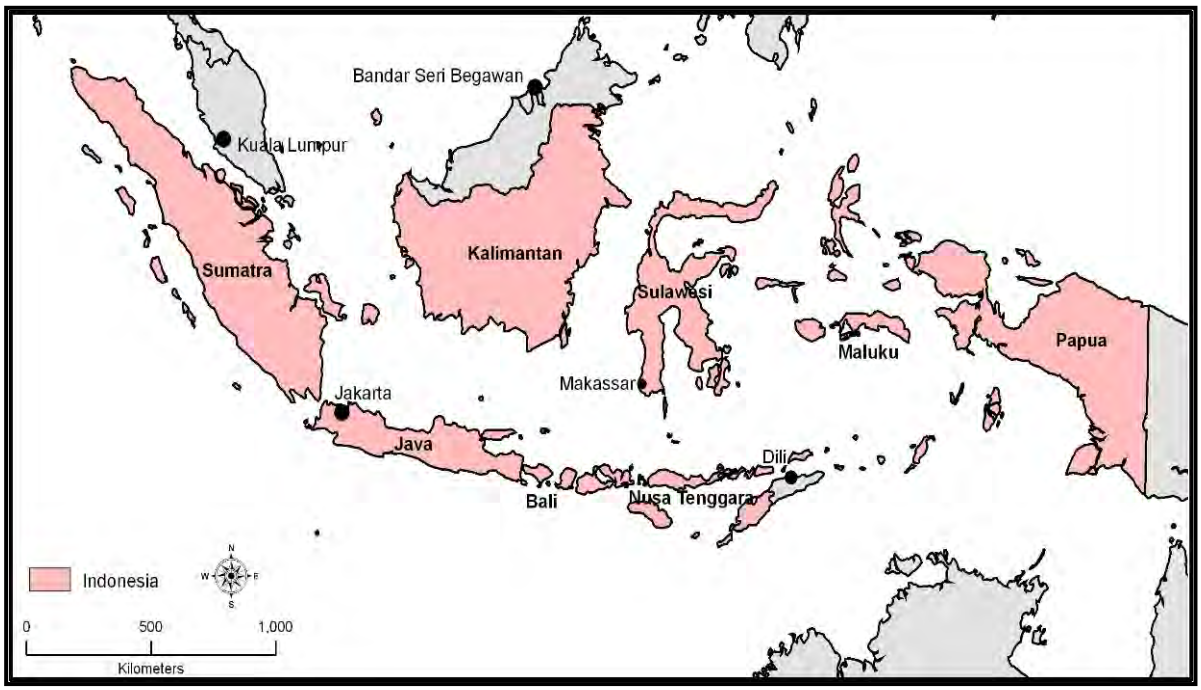

Figure 1.1. Map of Indonesia, showing Sulawesi Island in the middle of the archipelago where the fieldwork of this research took place

The geophysical nature of Indonesia as a constellation of 17,508 islands and its strategic location at the intersection between two oceans, the Indian and the Pacific, and two continents, Asia and Australia, makes it essentially important for this nation to have appropriate ocean and coastal governance regimes to sustainably manage the environment. Sitting right on the equator and being the world's largest archipelagic state, Indonesia's marine environment is endowed with highly productive coral reefs, mangroves and sea-grass ecosystems along a total of approximately 204,000 km of coastlines encircling its thousands of islands. It is blessed with an abundance of non-renewable resources: oil, gas and other minerals, and fisheries resources and recreational sites for tourism (Dahuri, 2003). Aside from being one of Earth's largest constellations of islands, Indonesia houses a burgeoning population of 212 million, the world's fourth largest (GoI, 2007). With its large population and vast natural

resources, Indonesia has to strive for economic development at the same time as conserving and ensuring the sustainability of its marine environment.

Table 1.1. The geographic summary of the Indonesian archipelago (source: Tomascik *et al.*, 1997).

i. Parameter	Unit	ii. Notes
Total number of islands	17,508	Major islands: Sumatera, Java, Sulawesi, major segments of Borneo, and Irian Jaya.
Coastline length (baseline)	80,791 km	The actual length of the Indonesian accumulative coastline stretch presently estimated at 204,000 km.
Total land area	1,926,337 km^2	24.4% of total area under Indonesian Jurisdiction.
Area of archipelagic (inner) seas	2,820,000 km^2	35.7% of total area under Indonesian Jurisdiction.
Area of territorial (12-nm zone) seas	420,000 km^2	5.3% of total area under Indonesian Jurisdiction.
Continental Shelf area	1,500,000 km^2	19% of total area under Indonesian Jurisdiction.
Area of Exclusive Economic Zone (EEZ)	2,730,000 km^2	34.6% of total area under Indonesian Jurisdiction.
Total area of national jurisdiction	7,892,350 km^2	

Being endowed with natural resources rich in diversity, Indonesia has been considered as one of the world's *megabiodiversity* sites. Although the land cover of this country represents less than 1% of the world's terrain area, it harbours approximately 17% of the world known total flora and fauna species. The highest diversity of shallow benthic species in the world occurs in the tropical Indo-Pacific (Polunin, 1983). Within this region, the highest diversity is centred on the Indo-Malayan area of which Indonesia is part (Dahuri, 2003). Indonesia's marine habitats support a large proportion of these biodiversity resources. Nevertheless limited capability to study the marine area, especially the deep-sea marine habitats, has rendered these resources largely unexplored.

The products and services that come from coastal and marine ecosystems are crucial to people's livelihoods. It is estimated that marine and coastal economic activities accommodate 13.6 million jobs or 16.2% of the entire national labour force

(GoI, 2007). Approximately 24% of Indonesia's GNP comes from coastal and marine areas through fishing, aquaculture, mining, forestry, transportation, tourism and other industries (Dahuri, 2003). Other data suggests that marine fisheries make up 4.4% of the GNP, whereas the sustainable yield of fisheries could reach 6.6 million ton/year while the production rate (average catch per year) at the same time was 4.4 million ton, or near the assumed Maximum Sustainable Yield (MMAF, 2006). As population numbers and development intensity will inevitably increase and, at the same time, terrestrial resources decline or are deemed difficult to develop, coastal and marine resources will be a primary trust for Indonesia's sustainable economic development in the future.

Located at the centre of the world's coral reef diversity, Indonesia has approximately 75,000 km^2 of corals or about one-eighth of the world's coral reefs. However, the quality of coral reefs in Indonesia is declining rapidly. More than 60% have been severely damaged due to a range of anthropogenic threats such as coral mining, harmful fishing methods, irresponsible tourism activities, sedimentation, land filling and other destructive activities (Cesar *et al .,* 1997). Mangrove forests are another precious coastal resource of Indonesia, which have been depleted by more than one third within the last two decades. Indonesia's total mangrove area was cut from 4.2 million hectares 1982 to 2.7 million hectares in 1993, mainly due to the conversion of mangrove forests into other land uses such as shrimp ponds, human settlement and industrial estates (Nurkin, 1994; Paez-Osuna, 2001). Managing these coastal resources had proven problematic in Indonesia. Wise management is needed but several pre-conditions will have to be met before it can be realised. This is what the thesis is trying to address, to identify the challenges and opportunities in utilising these coastal resources.

1.3.1. Indonesian Coral Reefs

Indonesian coral reefs form the core livelihood for millions of subsistence fishers, who rely for at least one-third of their catch on this ecosystem. In addition, coral reefs have been serving as fallback life support in time of agricultural hardship. Indeed, coral reefs are one of the most important natural treasures of Indonesia. Their quality however is declining rapidly. Indonesia's coral reefs have been undergoing

rapid destruction from anthropogenic assaults which include pollution, sedimentation, coral mining, overfishing and destructive fishing practices (DFP).

Pollution is mainly coming from untreated sewage and industrial discharges, whereas sedimentation mainly comes from erosion as a result of upland forest logging. Coral mining has been practiced for a long time mainly by locals where corals are collected for construction materials. From the five anthropogenic assaults mentioned above, overfishing and DFP are by far the main threats to Indonesia's corals (Cesar et al., 1997; Nontji, 2002; Dahuri, 2003; and Prasetiamartati, 2007). Overfishing occurred mainly due to the fact that most artisanal fishing resources in Indonesia are treated as open access with very little, if any, management measures.

Overfishing in Indonesia can be described as Malthusian overfishing (McManus et al., 2000; Dahuri, 2003), referring to the fact that high human population numbers have put pressure on the fish stock. As a result smaller and younger fish are being caught. This in turn has depleted the nearshore stocks making the fish harder to find. This has required longer working hours and greater distances travelled and therefore required more efficient methods and equipment to fish. It is in this situation that fishermen[1] are attracted to employ DFP. Overfishing, therefore, is closely link to DFP. Indeed, overfishing has induced the use of DFP, creating a vicious cycle leading to worsening fish stock numbers.

For Indonesia, coral reefs and associated habitats are an important part of the national renewable resource base. The shallow coastal areas, such as mangrove forests, lagoons and coral reefs are the most productive habitats, contributing to the protection and stabilization of vulnerable coastlines. Coral reefs and associated habitats are important resources for supporting traditional lifestyles in communities throughout the Indonesian archipelago. According to Tomascik (1993), 400 out of 700 identified corals genera exist in Indonesian reefs. The most extensive reefs of Indonesia are found in the eastern region of the country. Coral reefs in this region account for at least 70% of the national inventory. Coral reefs scattered in the deep clear seas around Sulawesi, Maluku and Papua are considered to have the highest national biodiversity and conservation value (Suharsono, 1994).

[1] The term fisherman/fishermen is used throughout this thesis. Although this term may not convey a gender neutral term, and therefore in other papers different terms are usually used, such as fisherfolk, it is important also to consider the fact that all the fishers in this area that I talked to and saw went down to the sea, were indeed men. Therefore it was decided to use the term fisherman/fishermen constantly throughout this thesis.

The extensive coastlines of the thousands of islands of Indonesia are mostly protected by coral reefs and support a diversity of reef types. Five structural types of coral reefs are present: fringing reefs, barrier reefs, atolls, apron reefs and patch reefs (Polunin, 1983). These reefs have highly diverse assemblages of reef fauna. Approximately 350 *Sclerectinian* coral species belonging to 75 genera have been recorded (Soeharsono, 1994). The two most important reef building coral genera in Indonesia are *Acropora* (i.e. the branching corals), and *Porites* (i.e. massive boulder corals). Both genera include a large number of species (Kenchington and Hudson, 1988). The great variety of coral growth forms found on the Indonesian reefs provides diverse living opportunities for a host of plants and animal.

Wilkinson (2000) provides a simple description of corals as an *aesthetic assemblage of sedentary animals and plants surrounded by colourful fish in crystal-clear tropical waters*. Coral reefs are found throughout the tropical and sub-tropical regions of Pacific, Indian and Atlantic Oceans, roughly between 23.5^{o} north and 23.5^{o} south (Kenchington and Hudson, 1988). Even though reef building corals are generally thought to be restricted to depths between the surface and 100m, the most vigorous coral reef development occurs in depths of 2 to 15 m. Light and warm temperatures are therefore thought to be the major environmental factors influencing the distribution of reef building corals.

Coral reefs have existed for 450 million years, making them likely to be the oldest ecosystem on the planet. Coral reefs have been considered to be the oceanic equivalent of tropical rainforests in terms of their biodiversity, complexity and net primary production (Tomascik, 1993). Just like the rainforests, coral reefs are characterized by functional complexity with complicated interactions between the physical and biotic subsystems, which are still poorly understood. Although globally coral reefs cover only 617,000 km^2, or approximately 0.1% of the total ocean cover, it is one of the most important ecosystems in providing primary productivity. The rate of a healthy coral reef's primary productivity per volume of area is 18 times higher than those of open oceans with the same volume (Kenchington and Hudson, 1988). It is little wonder that this ecosystem supports the existence of one third of known fish species. Coral reefs serve important functions for human welfare. The ecosystem maintains a pool of high genetic diversity which guarantees the ecological and economic potential of the reefs including fisheries, tourism, mariculture, industrial chemicals and raw materials (Cicin-Sain and Knecht, 1998).

1.3.2. Indonesian Mangroves

Mangrove forest is an important coastal habitat that has many functions for both human and species inhabits. This habitat is influenced by tide formations (the fluctuation of salinity gradients) because of its location at the interface between land and sea. The natural function of this coastal habitat is the capacity to reduce or to minimize incoming strong waves as well as its ability to distribute energy and organic matter to adjacent habitats (Woodroffe, 1985). This encourages many finfish and shrimp species to spend part or all of their life stages in this habitat. It is believed that mangrove forest is a highly productive ecosystem and rich in nutrients as well as in interactions with other type of coastal habitats, for example, sheltered coastal, estuarine, and deltaic habitats (Bengen and Dutton, 2004).

The existence of mangrove forests in the Sulawesi region has always been associated with mud and muddy fluvial deposits as well as the ability to establish cay, a particular mud bank structure often found along river banks in the tropics. Within this cay establishment, mangrove forests can facilitate sedimentation and accumulation of new sediments along their seaward margin. The sedimentation and accumulation of organic and inorganic particles can be of benefit to demersal shellfish species (e.g., crabs) for their food. Fringe mangrove forest is dominant in this region making it suitable for coastal aquaculture development for shrimp or fish species (Nurkin, 1994; Ronnback, 2002). Mangrove forest is believed to have an abundance of post-larvae, juveniles, and small-adult fish compared to seagrass species habitat. This occurs because the mangrove forest is a suitable nursery ground with the ability to provide food and to protect these young species from predators at the same time. For example, the abundance of crab zoea in this habitat results from its functional links between primary production and secondary production of several fish and crustacean species that are essential for crab nursery grounds. At the same time human coastal communities utilise mangrove vegetation, especially *Rhizophora, A vicennia,* and *Bruguera* species as a source of livelihood, for example, for firewood, boat and house construction.

1.3.3. Current Context of Resource Management in Indonesia

In relation to its natural resource governance, Indonesia has a three-tier government system: national, provincial, and local. Local government is categorized into districts and municipalities (or towns). Like many developing countries, Indonesia is currently under heavy pressure to maintain development imperatives via the use of environmental resources while maintaining ecosystem attributes such as productivity and diversity (Bengen and Dutton, 2004; Nontji, 2002). Indonesia's coastal resources are central to the country's economic-environment development. In addition to development pressures, over the last decade Indonesia has been faced with the transition from four decades of centralised rule to a more locally- and regionally-focused environmental resource use and management (Hill, 2000; Dahuri, 2003).

There are three important cornerstones of contemporary coastal resource management in Indonesia. These are: (1) the establishment of the Ministry of Marine Affairs and Fisheries (MMAF) in 2000; (2) the implementation of the decentralisation policy begun in 2001; and (3) the enactment of Law 27 of 2007, the National Act for the Management of Coastal Areas and Small Islands. To understand these changes further, it is important to review them within the historical context that produced them.

In 1998, Indonesia underwent a massive transformation which led to several fundamental changes. Initiated by the Asian economic crisis in 1997, Indonesia underwent a financial crisis which soon metamorphosed into economic crisis. This was followed by a crisis in politics, and eventually became a multidimensional crisis (Seymour and Turner, 2002). The politics of Indonesia rapidly unravelled from one of a relatively stable authoritarian regime under President Soeharto, operating within a highly centralised unitary state, to one constantly under attack from many sectors of society (Sullivan, 2000). These sectors found common ground in a general push for a democratic reform, popularly known as *reformasi*. The protests associated with *reformasi* were nationwide and often violent. The government was unable to control the situation, resulted in the collapse of the Soeharto regime. This collapse of power was marked by several bloody conflicts amongst local people and political upheaval (Aspinall *et al.*, 1999). In May 1998, Soeharto stepped down as a president. From this turmoil Indonesia sought a new political and economic direction. This gave rise to a new era of *Reformasi* or the Reform Era, which was associated with a new

institutional arrangement, based on a decentralised system. Booth (2003), World Bank (2003) and later on Fengler and Hofman (2009) have highlighted Indonesia as a country that changed from one of the most centralised administrations in the world to one of the most decentralised.

The Reformasi also brought a new era in managing coastal areas and marine resources in Indonesia. It began with the establishment of the Ministry of Marine Affairs and Fisheries (MMAF) in 2000, a bold political decision by the former President Abdurrahman Wahid who pushed for a change in paradigm from terrestrial-oriented into a more maritime-oriented vision. Geographically, Indonesia is the world's largest archipelagic country with a marine area three times larger than its land, and therefore it is only natural to put more attention into the seascape. This is the first time after 55 years of independence that Indonesia has paid formal attention to managing its seascape and marine resources. For almost five decades, marine resources management in Indonesia has suffered from a confusing ambiguity of laws and jurisdictional disagreement (Patlis, 2005; and Dirhamsyah, 2006). Before the creation of MMAF, coastal and marine resource matters were handled sectorally in different ministries. Sloan and Sugandhy (1994) identified that at least 14 ministerial departments and agencies were involved in addressing coastal matters, with many overlaps and uncoordinated jurisdictions. The establishment of MMAF allows for a more concerted effort to address problems in coastal communities and sustainable development of the marine resources.

Another important cornerstone in the management of coastal and marine resources has resulted from the implementation of two new laws, Acts No. 22 and 25 of 1999 which were later revised as Acts No. 32 and 33 of 2004 respectively. Act No. 32 of 2004 concerns Regional Government, and is also known as the Autonomy Act, whereas Act No. 33 concerns Financial Distribution, Central and Regional Government. It is also known as the Financial Distribution Act. Both Acts, however, are more popularly known as "Decentralisation Laws".

The fall of President Soeharto and the subsequent democratisation of Indonesian politics are reflected in these decentralisation policies. They have had tremendous impacts on marine resource management. The new legislation transferred responsibility and authority over various issues, including resource extraction and local governance, from central government to regional authorities at the district level. Act No. 32 of 2004 gives broad autonomy to the regions while only a few tasks are

explicitly assigned to central government, among them: defence, security, justice, foreign affairs, fiscal affairs and religion. Act No. 33 of 2004 provides for an almost complete transfer of budgetary management from central to local government. The implementation of acts 22 and 25 of 1999 came into effect on January 1st 2001. The enactment of these decentralisation laws has shifted management of almost all social, economic and environmental issues to the regional level, consisting of 33 provinces and approximately 420 districts and municipalities. Although at first it created a great deal of conflict, confusion and questions within the bureaucracy, ways were soon found for many local innovations and solutions. With these two acts, Indonesia embarked on an ambitious, radical, and yet rapid transition for decentralisation (Fengler and Hofman, 2009).

From the natural resource management perspective, these decentralisation laws emphasise the devolution process and enhance the community's role in managing resources. These laws readjusted the hierarchical relationship between the provincial and local governments. The local governments, both municipalities and districts (in Indonesian known as *kota* and *kabupaten* respectively), became autonomous and were no longer obliged to report to the provincial government. The laws also give more authority to local governments to manage their resources in a way they perceive to be appropriate and sustainable. This further reflects a trend of managerial decentralisation where central authority devolved management autonomy to organizations and units providing direct services to local communities, and therefore required an implementation of mutually agreed goals and objectives. More community and stakeholder involvement has implications for de-bureaucratisation and the empowerment of civil society.

The third cornerstone is the enactment of Act No. 27 of 2007 concerning the Management of Coastal Areas and Small Islands. This act came to being after going through a complex process of legislation making and consultation. Seven years in the making, with dozens of public consultations, two periods of national parliamentary sessions, and considerable input from MMAF, this act was finally passed by the National Legislative board (Numbery, 2008, pers-comm). According to Dahuri (2003), at least 20 parliamentary laws and hundreds of regulations and ministerial decrees related to the management of coastal and marine resources. Patlis (2005) also reported that more than 14 sectors address some aspect of coastal resources, and approximately 22 statutes and hundreds of regulations govern those 14 sectors. This

situation presented a series of complicated problems: the laws needed to be harmonized to prevent ineffective and incompetent management, they were sectoral-based lacking in integration with no concern with sustainability principles (Dutton, 2004), and the enforcement of those laws caused ineffective management, conflict, redundancy, and gaps among the development sectors of the country (Christy *et al.*, 2005). These eventually led to increasing conflicts of interests among different users and threats to marine resources as well as to coastal communities (Dahuri, 2003).

The enactment of Act No. 27 / 2007 has generally been welcomed and viewed as an important keystone to producing a more concerted effort to manage the coastal and small islands areas in Indonesia. However, there have also been criticisms toward the substance of the act, mainly from the NGOs, academia and civil society representatives (Karim, 2008). Their objections are mainly directed to four areas of the act which are considered to be at odds with small coastal or island communities' interests. These four objections are: (1) the act allows too much access for big business to claim the coastal areas; (2) the act shows inclination toward exploitation, with little incentive paid to conservation; (3) there are several articles in the act that are considered negative for local coastal communities, not siding with their needs, and possibly closing their access into the resource; (4) The act tends to weaken local participation, and instead gives wide room for commercialisation of coastal resources.

At this stage, it is still too early to draw conclusions about the long-term impact of these three cornerstones. The establishment of MMAF has produced a series of positive impacts in terms of bringing the marine-related issues to the forefront of political arena, and therefore getting more attention and resources to deal with. After eight years of decentralisation and regional autonomy policies, a great number of changes have taken place. The impact of decentralisation however shows mixed outcomes (Duncan, 2007), though the progress it has induced are mainly positive. It is too early to assess the impact of the Act No. 27 of 2007 (management of coastal and small islands), since its implementation only begun last year. However, the fact that it finally exists after going through a long process of creation is a good sign. Finally, in reviewing decentralisation and democratisation in Indonesia today, the main development challenge is not to transfer significant additional resources to poor regions, but to make sure that the existing resources are utilised effectively and efficiently. In other words, it is a question of resource management.

Managing Indonesian seas and their invaluable marine and coastal resources is a complex and particularly challenging task. These resources provide subsistence activities for many people and are expected to contribute to the country's economic growth in the future. To meet this demand, wise management of the marine and coastal ecosystems is essential. One important aspect of managing the marine and coastal environment is recognition of the complexity and uncertainty of these ecosystems. The crucial challenge for Indonesia now is how to strive for economic development by optimally utilising its invaluable natural resources without altering the sustainability of ecosystems.

1.4. STRUCTURES OF INQUIRY AND ORGANIZATION OF THE THESIS

This research is about resource utilization patterns and their management within a developing country context. The outcome of this endeavour is expected to enhance current understanding of the dynamics of coastal resource use in Indonesia, and to provide a strong basis for appropriate decision making in addressing the resource problem. In order to achieve this outcome, this research aims to address a series of questions derived from the main research question stated at the opening of the thesis. This is:

If the sustainability of coastal resources is vital for the livelihood of local communities, why are these resources being continuously degraded, often to the point of complete destruction?

A series of secondary research questions have been used to frame specific case studies. The questions on coral reefs in chapter 5 are:

- *What are the rationales behind blast and poison fishing activities?*
- *How do blast and poison fishing differ in their impacts on coral reefs?*
- *Is the state of local coral reefs associated with their use in multiple ways and with other potential conflicts within the local community and, if so, how?*

The questions used in the mangroves case study in chapter 6 are:

- *What are the rationales behind the conversion of mangroves to shrimp ponds?*
- *What are the rationales behind mangrove replantation by local communities?*
- *How are the roles and meanings of mangroves associated with communities' dependency on, and appreciation of, this ecosystem?*

The synthesis of the two case studies, framed around the approaches to coastal resource management needed to generate sustainable livelihoods, is based on these questions:

- *Do the challenges to conservation differ between coral reef and mangrove ecosystems, and what works in the conservation of these ecosystems by local communities?*
- *What are the main components of resource-utilisation, and how do they relate to livelihoods?*
- *How do top-down and bottom-up approaches to achieving sustainable development differ?*

These research questions are central to the inquiries and discussions explored throughout this thesis. The processes which lead up to finding answers to those research questions are documented in each chapter of the thesis.

The thesis is consisted of four parts which are structured into eight chapters. Part One, consisting of chapters I to IV, serves as the framework within which the other three parts of the thesis are placed. This first chapter has introduced the context of the problems this research is striving to address, describing the research's objectives and rationales, and setting out the insights this thesis will contribute. Chapter 2 reviews the theoretical foundations and practices of coastal resource management and questions the sustainability of such practices. It introduces the concept of Integrated Coastal Management (ICM) and some lessons learned from its world-wide implementation. It provides the context of global to local regime of coastal resource management.

Chapter 3 continues the review of the theory and practices of coastal resource utilization by providing more focus on community livelihood, the notion of community-based resource management, and how these community-based approaches address the challenges to resource sustainability. The last chapter in Part One

introduces the approaches and analytical framework used in examining research data, and establishes the methodological framework through which the thesis will examine, analyse, and produce insights.

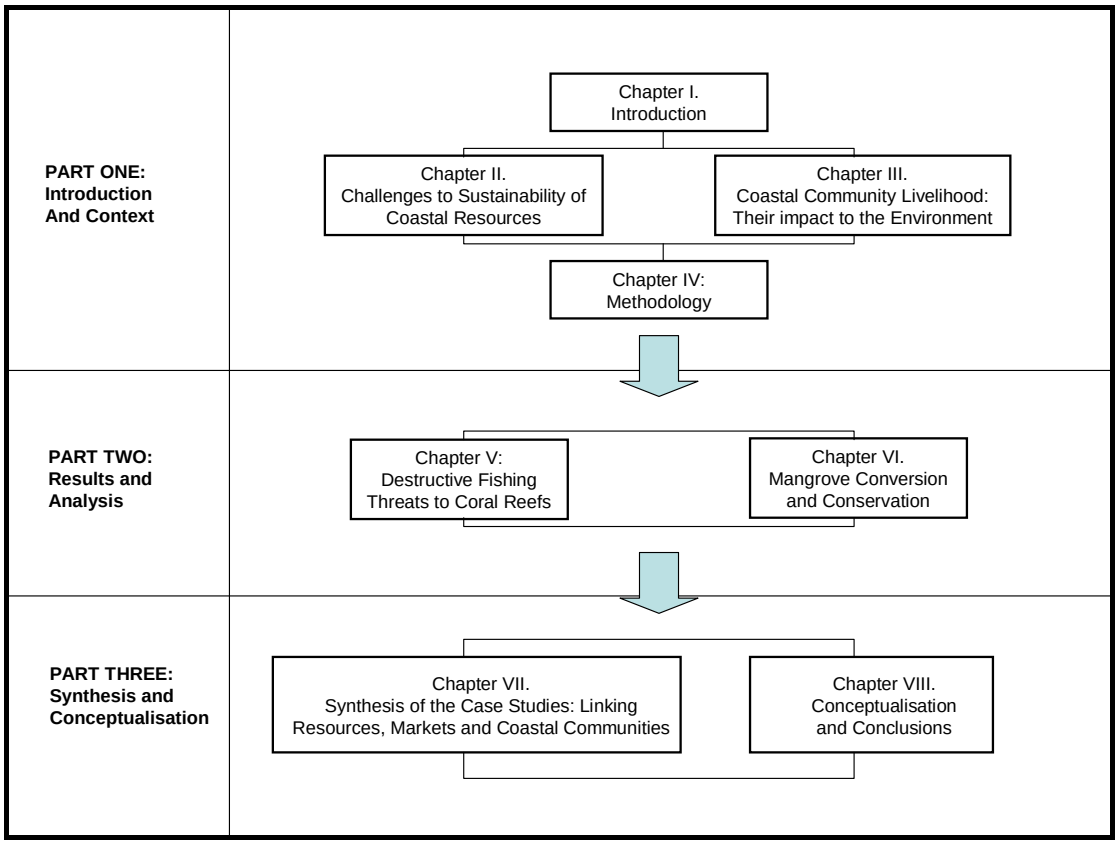

Figure 1.2. The structure of the thesis. The thesis consists of three parts which are structured into eight chapters.

Two result chapters based on the two case studies follow in Part Two. Chapter five examines critically the origin, motives, and tendency of Destructive Fishing Practices (DFP), their ecological impacts, and the challenges they brought into the realm of coastal community dynamics and livelihoods. Using a similar framework, chapter six examines critically the dynamic of mangrove utilisation through comparative analysis of conversion and conservation approaches.

Part Three of the thesis, chapters seven and eight, is about synthesising the lessons learned and formulating strategies for action. Based on the results presented in previous chapters, chapter seven looks at the bigger picture of resource management by examining the connection between the commodities market, resources, and the

communities that utilise them. It provides the synthesis of lessons learned from the two case studies, identifies the key issues and describe the important roles of each of main stakeholders. Chapter eight sets out to explain the interdependence of resource sustainability and the livelihood of local communities. It presented a model synthesising the dynamic interrelations of human and natural aspects, and further proposes a framework to generate resource sustainability. This concluding chapter of the thesis identifies policy implication of the research findings, their limitations, hence further research needed, and offers an overarching empirical insight drawn from the research.

CHAPTER II. CHALLENGES TO MANAGING COASTAL RESOURCES SUSTAINABLY

2.1. INTRODUCTION

This chapter reviews the challenges to managing tropical coastal resources within the context of a developing country like Indonesia. It introduces the problems faced in utilizing resources and further lays out the challenges faced in the effort to manage them. Practical as well as theoretical questions need to be addressed in dealing with problems of managing coastal resources. It provides an overview of theoretical foundations and practices, and questions the sustainability of such practices. The concept of Integrated Coastal Management (ICM) and some lessons learned from its world-wide implementation are examined. Finally the concept of global to local regimes of coastal resources management is explored.

2.2. CHALLENGES TO MANAGING COASTAL RESOURCES

One immediate challenge in an attempt to plan and manage coastal resources is to provide an appropriate definition of what is a 'coastal zone'. Sorensen *et al*. (1984, p. 4) referred to a coastal zone as "the interface or transition space between two environmental domains, the land and the sea". Therefore, the coastal zone can be viewed as a broad geographic area in which terrestrial, marine and atmospheric factors interact to produce unique landforms and ecological systems (Tomascik, 1997 and Brown *et a l.*, 2002). It is generally agreed, in regard to resource planning and management, that the coastline includes the hinterland, the intertidal and the sub tidal areas (French, 1997). However, it is yet to be clarified as to how much of the hinterland and how much of the sea should be included. Because of variations in coastal topography and coastal processes, the precise landward and seaward limits are difficult to determine for a single coastal management policy and vary according to the area in which the management measures are being adopted (Dahuri *et al.*, 1996).

More importantly however, managing coastal resources is primarily about managing human activities and not just the physical environment *per se*. A definition

of the coastal zone, for management purposes, must therefore explicitly include human activities and recognize ecosystem functions. Such recognition acknowledges that, for example, a watershed is a natural boundary for an area and furthermore, the zone of effects of human activities and other anthropogenic impacts is likely to be influenced by drainage patterns in the watershed in question. Figure 2.1. provides an idealised configuration of a "managed" coastal zone with multiple uses, interests and activities related to its resources. The nature of multiple interests in coastal resources consequently brings the potential of conflict over these resources and therefore must be addressed through appropriate management approaches.

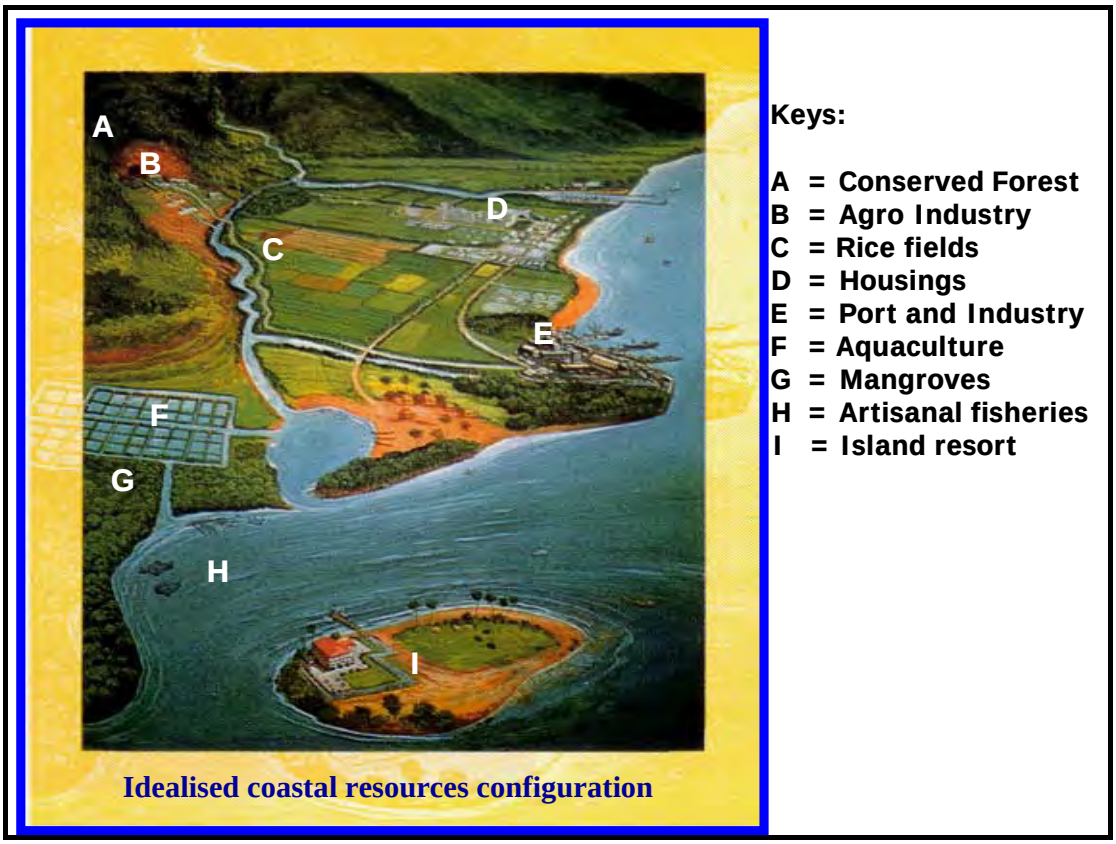

Figure 2.1. An idealised configuration of resource utilization in coastal zone managed through an integrated approach as a means of addressing the potential conflict arising from multiple interests in these resources, such as in an Integrated Coastal Zone Management regime. (Adapted from Dahuri, 2003)

In most developing countries, the coastline is one of the fastest growing areas. People choose to reside along the coastline to allow them to be able to take the most advantage of two resources simultaneously: the terrestrial and the marine. Coastal environments in tropical climates are among some of the world's richest ecosystems.

The shorelines of tropical oceans have been characterized as a typical multiple-use environment with a variety of natural resources and services to human beings, and are considered to be the area where human populations procure the most advantage from the marine resources (Ming *et al*, 1991; Borgese, 1998). Subsequently, these areas are swarming with human settlements and are among the highest growth areas in terms of economic development as well as population burden.

Although coastal zones cover less than 15% of the earth's land surface, this is where the majority of the world's population resides and sustains its life (World Bank, 1993). The population growth in these areas is relatively higher than in other inland or terrestrial habitats, subsequently imposing heavier pressures upon their natural resources. In Indonesia, for example, the coastal population has been growing at an average of 2.0 to 2.7% per year, which is significantly higher than the national average of 1.26% (GoI, 2007; UN-DESA, 2006). This higher rate is mainly due to urbanisation, considering that seven out of ten metropolitans in Indonesia are located on coastal area. Coastal resources support a wide range of activities which provide livelihoods for many people who work in industries such as fisheries, aquaculture, tourism, and transportation. On the coast there are industrial sites as well as waste sinks from land-based activities. Furthermore, oil, gas and other minerals have also been tapped in these regions for economic development (Tomascik *et al* , 1997). Indeed, coastal resource utilization and extraction are inseparable aspects of the socio-economic realities of coastal communities.

Despite the important role of coastal and marine ecosystems to the Indonesian economy and community livelihoods, there is accumulating evidence of environmental problems in many coastal areas. Indonesia's coastal regions at present are under increasing pressure from incompatible development activities compounded by a burgeoning population. The situation is worsened by the increasing level of pollution caused by the intensity of development activities. In many coastal waters, particularly those adjacent to urban or densely-populated areas, the level of pollution has significantly exceeded allowable environmental standards (Dahuri, 2003; Fauzi, 2005). Dutton (2004) identified ten threats to Indonesian coastal resources and development: destructive fishing practices; overfishing; increased run-off and sedimentation; sewage and other land-based pollutants; oil pollution and shipping; mining and quarrying of sand and corals; tourism and associated infrastructure development; coastal urbanisation; habitat destruction and species lost; and climate

change. The fact that almost 70% of its population at present lives along the coastline is reason enough to point out that the management of coastal resources is a very important issue and among the highest priorities for Indonesia to address.

Previous experience clearly shows that development pressures have put significant stresses on coastal resources resulting in widespread environmental quality degradation (Dahuri *et al.*, 1996; Dahuri, 2003). In addition, there is a lack of effective coordination and cooperation among the sectoral agencies responsible and a weak institutional capacity to enforce necessary laws and regulations. These factors further exacerbate these resource and environmental problems. In the end, local communities, whose livelihood directly depends on their access to and availability of coastal resources, are facing great challenges in obtaining adequate and sustainable economic benefits.

Managing Indonesian seas and their invaluable marine and coastal resources is a complex and particularly challenging task. These resources provide subsistence activities for many and are also expected to contribute to the country's economic growth well into the future. To meet this demand, wise management of the marine and coastal ecosystems is essential. One important aspect of managing the marine and coastal environment is recognition of the complexity and uncertainty of these ecosystems. The crucial challenge for Indonesia now is how to strive for economic development by optimally utilising its invaluable natural resources without undermining ecosystem sustainability.

2.3. DEFINING RESOURCE SUSTAINABILITY

The term "sustainable development" gained its popularity through the highly influential 1987 report of the World Commission on Environment and Development, *Our Common Future*. The report defines sustainable development as "Development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED, 1987. p. 43). As a goal, sustainable development rejects policies and practices that support current living standards by depleting the productive base, including natural resources, and leave future generations with poorer prospects and greater risks than our own.

Sustainable development has been the path that many states and governments in the world embrace today to continue the progress of improving their society's welfare. The approaches taken and their operational formats, however, have varied markedly among the different countries (Yusuf and Stiglitz, 2001). Like many other developing nations, Indonesia's model of development is one which relies heavily on a rich natural resource base for generating economic wealth and enhancing the living standard of its people. While there have been apparent successes in poverty alleviation, the national development programme has been criticised for its pressure to exploit resources (Dahuri, 2003; Dutton, 2004). Indeed, natural resources have played such a central role in Indonesian economic development that many of it resource bases have been depleted and their sustainability has been undermined.

The underpinning assumption in projecting the sustainability of resource management is that it strives to improve the living conditions of all individuals by developing land and water resources in ways that are economically viable, socially equitable and environmentally sustainable (Borgese, 1998; Pawson, 2001 and Adger *et al.,* 2005). These authors are in general agreement and suggest that such ideal must be addressed within the following four sustainability criteria: a). *Ecological Viability:* the physical and biological processes that maintain the productivity of natural ecosystems must always be kept intact. b). *Social E quity:* the people themselves should be fully committed to supporting sustainable development activities: this could be realized by fostering equity in access to resources and benefits derived from them, and through participative processes. c). *Economic Efficiency:* in the face of scarcity, economic capital and resources should be kept stable, and utilized to improve the quality of human life. This is done to maximize human welfare within the constraints of existing natural capital stocks and technologies. d). *Integrated app roach:* this generates a holistic view of problems and issues prevailing in the environment, as well as opportunities for cooperation and sharing, that will eventually provide the resources, coordination and political will to implement and sustain programme activities (Chambers, 1980; Cicin-Sain and Knecht, 1998; and Dahuri, 2003).

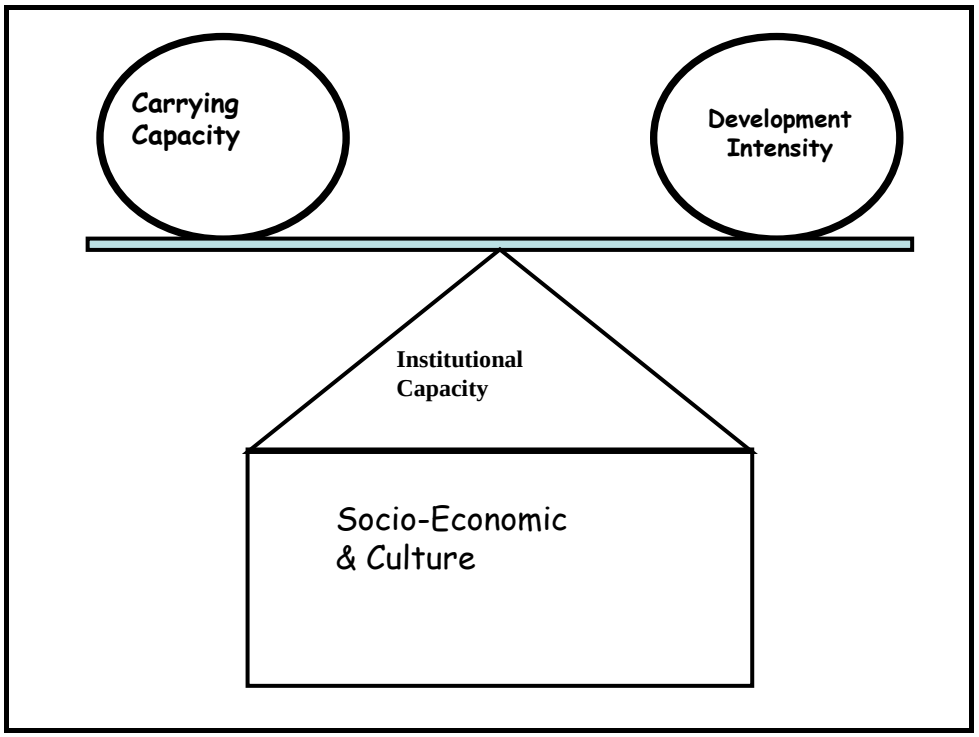

Figure 2.2. A simple illustration of sustainable development as a dynamic process of maintaining a balance between environmental carrying capacity and the intensity of development pressures.

The basic challenge in planning and managing coastal resources is to strike a dynamic balance between the need to maximize resource utilization and production with the maintenance of development options that are needed to fulfil future needs. Within the context of coastal resource management, Chua (1993, p.72) suggests that sustainable development is a "dynamic balance between the limitation of opportunities for economic development *vis a vis* an acceptable reduction in environmental quality". Figure 2.2 provides a simple depiction for achieving sustainable development as a process of striking a balance between environmental carrying capacity on the one hand and the intensity of development pressures on the other. It is a dynamic process in which the balance is defined and maintained by the availability of institutional support, and the appropriate balance is attained based on the socio-cultural nature of the community.

Management for sustainable use, while being an appealing concept, nonetheless is very difficult to implement. The main constraints in developing and implementing sustainable strategies for coastal resource development are related to conflicting perceptions of *what* and *who* is to be managed, how to define the effectiveness of particular management measures, and what are the criteria for a

successful programme. Sustainable development can only be achieved through a well-maintained coordination of multiple use strategies which allow a complementary balance between the various, and often conflicting, demands that are placed on the coastal environment.

Sustainable development is -in essence- human endeavour to effectively utilize the ecological endowment provided by the biosphere or by an ecosystem of a given spatial unit on earth. This should be done in such a way that its future functioning and capacity of the ecosystem to produce benefits for human beings are not impaired. As population numbers and development intensity will inevitably increase and, at the same time, terrestrial resources decline, coastal and marine resources will be of primary importance for Indonesia's sustainable economic development. Unfortunately, current management efforts are yet to reflect for such objectives.

2.4. A CRITIQUE OF COASTAL MANAGEMENT CONCEPTS

Marine resource management is a newly emerging field and has developed rapidly in the last two decades. As people understand more about the dynamics of nature, came recognition that natural resources are finite. Even with those resources that came from the ocean, which might be seen as a boundless environment and unexplored territory, still there is a limit imposed by nature on the availability of resources extracted to fulfil human needs.

The idea of "managing" natural resources came from an inclination to tame the dynamic relationship between the environment (coastal) system and the human (social) system. Figure 2.3. illustrates the dynamic complexities between these two systems. The social system takes advantage of the coastal environment system to provide goods and services through development activities. These occur as at least three types of use: resource extraction, spatial use, and environmental services. In return, humans through these development activities generate by-products, such as waste, which go back to the environment. Under low intensity exploitation, the environment will assimilate the waste and the relationship between the systems remains stable. When resource exploitation becomes intensive, the generation of by products will be intensified, and the environment will lose its ability to balance resource extraction and the assimilation of waste. Under such circumstances, the

relation between the two systems degenerates, and will deteriorate further when there is no effort to return the environment to its "equilibrium" condition. To address such problems therefore, an intervention of policies and programmes is needed to maintain the delicate balance in the environmental systems in order to continue its product of goods and services for use by the human system.

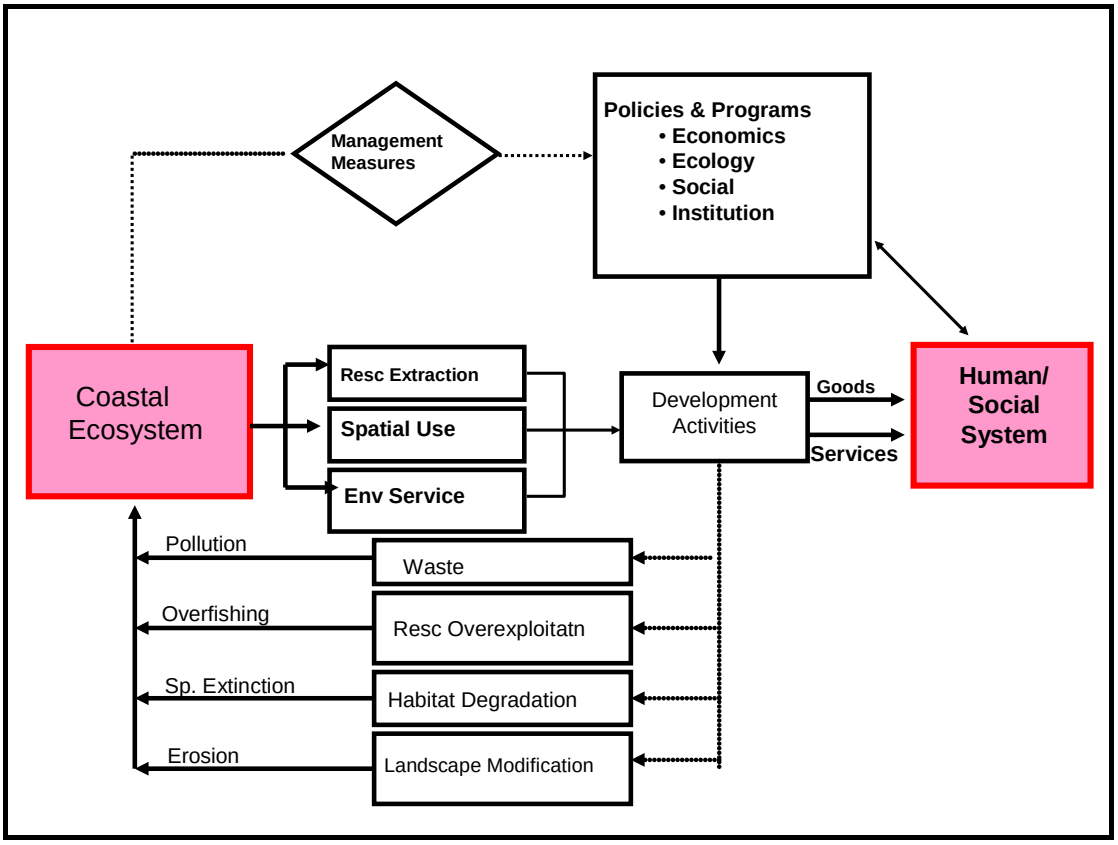

Figure 2.3. Resource Management is a series of Policies and Programmes designed to maintain a dynamic balance in the relationship between the (environment) Physical System and the (human) Social System.

The growing awareness of the rapidly increasing complexity of environmental problems has served to induce growing demand and interest in an integrated approach to managing the interaction of humans and their environment. In response to the vast increase in human activity and the ever-present threat and reality of irreversible environmental degradation, a growing awareness has emerged that coastal zones require specific and concerted management and regulatory efforts. The worldwide recognition of sustainable development has further advanced awareness of the need for an interdisciplinary approach in addressing problems of coastal resource strategy and development. In particular, problems that focus on the biological, economic and

social impacts of regulation policies are significant. In short, appropriate coastal resource planning and management efforts must ensure, i.e. conserve and protect, the presence of these vital coastal resources not only for the benefit of the present generation, but indeed for those of the future.

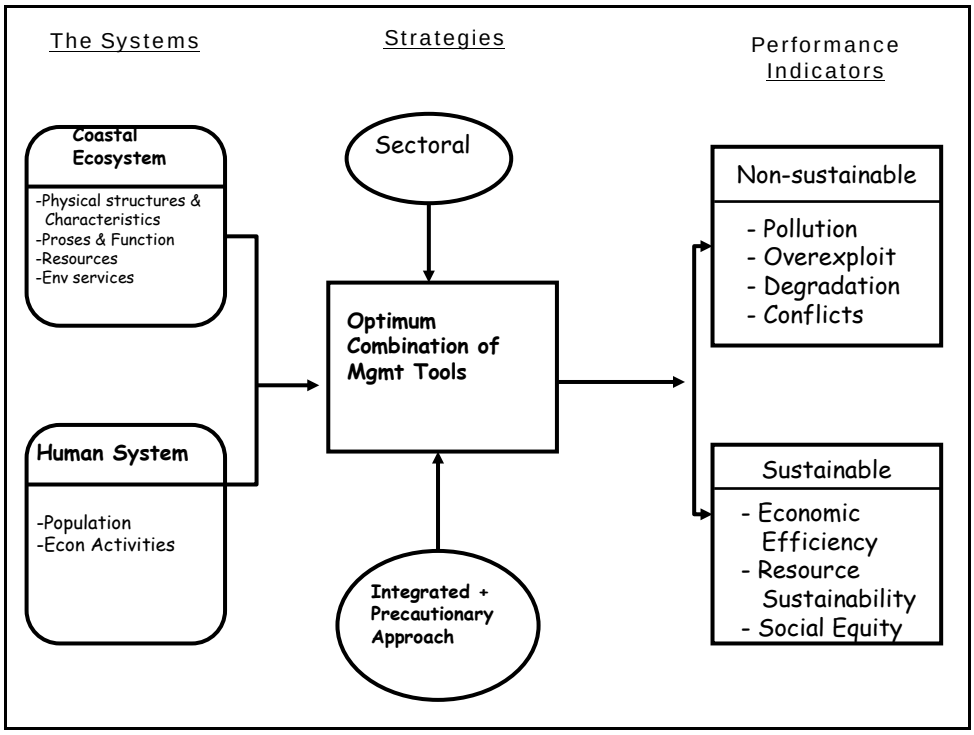

Figure 2.4. System Analysis Approach in Coastal Management (adapted from Dahuri, 2003).

The complexity and uncertainty inherent in both natural and human systems have led to the use of system analysis and model applications in the planning and managing of natural resources. Figure 2.4. provides an approach to addressing the intricacies in managing the relationship between the human social system and the coastal physical environmental system through the lens of system analysis. It indicates two alternative sets of outputs from coastal resource development, one set towards sustainable outcomes and the other non-sustainable. Sustainable outcomes would only be achieved through the choice of strategies which involve carefully chosen management tools based on a good understanding of what exists in the systems in question.

Despite the long history of people's interest in coastal areas and their ecosystems, the study of a rigorous performance and concerted approaches in planning

and management of coastal resources is nevertheless a relatively new field (see among others: Clark, 1996; Cicin-Sain and Knecht, 1998; Kay and Alder, 1999; Brown *et al.*, 2002 and Dutton, 2004). Nevertheless, the movement toward problematisation of the coastal resource crisis has seen a concerted effort to develop a consensus, at least on the theoretical front, among scholars and practitioners that the best, and may be the only, way to deal with this complexity is through an integrated approach especially framed for joint management of land and water involving the multitude of aspects existing in the coastal zone. This strategy relies on "innovative" forms of planning and resource management which have been rigorously promoted as Integrated Coastal Management (ICM), or Integrated Coastal Zone Management (ICZM). Cicin-Sain and Knecht (1998) summarized the purpose of ICM as "to overcome present and future problem of coastal resource development, to provide sustainable methods of resource utilization, and to empower coastal communities and coastal resource stakeholders"(p.18). In addition, the GESAMP report (1996) defines ICM as "a continuous and dynamic process that unites government and the community, science and management, sectoral and public interests in preparing and implementing an integrated plan for the protection and development of coastal ecosystems and resources" (p.2).

ICM strategy emphasizes *Integration* to address multiple demands for the use of coastal resources. It is a conceptual framework rigorously promoted as a derivative of sustainable development within which the cumulative, multisectoral environmental consequences of coastal resource utilisation can be managed to remain within tolerable limits. The ICM approach was identified by Agenda 21 of the United Nations Conference on Environment and Development in Brazil (UNCED) in 1992 as "potentially the most effective mechanism to manage the coastal and marine environment and to achieve sustainability".

There has been considerable progress in defining the major characteristics of ICM (Post and Lundin, 1996; Sorensen, 1997; Scialabba, 1998; Brown *et al*., 2002; and Christie *et al*. 2005). All of these definitions stress the dynamic nature of the ICM process and its emphasis upon sectoral integration. ICM is considered unique for the concern it pays to the area of interface between land and sea, involving spatial, ecosystem, politics, economic and social dimensions, and their interdependencies in this area of interactions.

There is a whole range of factors that may impede the effectiveness of an ICM programme. As a developing concept, its effective implementation is still elusive in many parts of the world and there is much more to learn to improve its performance. Scura *et al*. (1992) and Christie *et al*. (2005) identified, based on lessons learnt from earlier ICM implementation in Southeast Asia region, that problems and challenges over development and implementation of a sound ICM are mainly related to lack of understanding of the nature of coastal areas, lack of financial and managerial support, and lack of political will. While the proponents of ICM may consider these constraints merely as impediments to a successful ICM programme, the problems actually run even deeper. These constraints are part of the problems that ICM should address and their occurrence shows the failure of ICM concepts to move beyond them and solve the problems. To follow this analysis, the next part of this critique looks at these constraints. They are divided into three, loosely-defined general categories: physical, implementational/operational, and political.

2.4.1. Physical Constraints

An understanding of the nature of coastal regions is essential in constructing a critical assessment of the coastal resource management regime. Coastal ecosystems are unique entities because they form the nebulous transition from sea to land. Ecotones such as estuaries, sea beaches, storm waves, daily tides, mangrove forests, coral reefs, barrier islands and littoral zones are found only on the coast. It is widely recognised that the coastal ecosystems are intricately interlinked (Burbridge *et al*., 1991, and World Bank, 1993). Many small activities in the coastal zone which have been thought to be merely trivial can in fact have a significant cumulative impact, such as artisanal fisheries and domestic waste disposal.

The environmental crises occurring in coastal areas are closely related to the lack of understanding of the nature of coastal areas. ICM is meant to address such crises. In retrospect however, ICM implementation has suffered the challenges of a complex environment which undermines the outcome of the programmes. A review of coastal management literature shows that there are three primary physical constraints to consider when implementing a coastal resource planning and management programme. These are: the inherent dynamics of the coastal zone, which mainly relate

to the uncertainty and complexity of coastal ecosystems; the overstretching of the ecological carrying capacity, and anthropogenic disturbances.

1. Inherent dynamics of the coastal zone

Much of the lack of understanding of the nature of coastal areas owes its source to the fact that the typical coastal ecosystem is a highly complex and dynamic system. Uncertainty is an inherent character of a dynamic and complex system (Ludwig *et al*., 1993), and consequently it is an inescapable feature of planning and management of coastal resources. Such a situation is even more obvious in a tropical environment. Tropical coastal ecosystems are very rich, they are high in biodiversity, complex and yet very fragile (Polunin, 1983). This fact presents a particular challenge to rationally managed renewable resources in coastal areas; for example, in fisheries. The tropical environment presents a paradox to fisheries management. On one hand, there is a great diversity of species inhabiting the tropical oceans, yet on the other hand, there is only a small population within each species; consequently, tropical fisheries are very vulnerable to any expansion of industrial exploitation.

Despite current research efforts, understanding of coastal ecosystems and ecological processes remains poor and inadequate to comprehend the complexity and uncertainties of the coastal environment. Charles (1998) identifies three principal forms of uncertainty with regard to fisheries: random fluctuations, uncertainty in parameter estimates and states of nature, and structural uncertainty. Inability to comprehend these uncertainties within a complex system such as a fishery has resulted in management failures such as those seen in many collapsing fisheries around the world. The picture is even more grim in the light of the scarcity of scientific information and technological support in developing countries, with whom the responsibility for most tropical coastlines lies. Because of such conditions, addressing uncertainty and complexity is becoming a great constraint on planning processes and management measures, and an impediment to realizing an effective ICM.

It must be admitted that the present state of knowledge, even the most advanced one, has not been sufficient to eliminate uncertainty within a dynamic system such as coastal areas. Thus, for management purposes, coastal ecosystems should not be considered as independent, non-interacting units. An essential precondition for a sustainable resource strategy is the design of a management

framework that is capable of coping with uncertainty. Proper management for natural resources needs to be robust yet adaptive. Such an admission calls for more attention to be given to a precautionary approach in constructing coastal resource planning and management regimes.

2. Overstretching of the ecological carrying capacity

The primary threats to sustainable development occur essentially because human demand for ecosystem services has exceeded their carrying capacity. Although the term "carrying capacity" has generated considerable debate in ecology, it serves a useful purpose in defining the maximum density of organisms that a particular environment can sustain in perpetuity (French, 1997; and Boyd and Charles, 2006). The human race utilizes the carrying capacity of coastal areas in two ways: extraction of resources provided within the area, and the assimilative capacity of waste disposal. The anthropogenic impact on coastal areas shows that pressures over carrying capacity have been going on in both directions: overexploitation of resources as well as excessive dumping of waste.

There is a wide range of carrying capacity problems in coastal areas, including overexploitation of living resources, increased pollution, habitat degradation and declining marine environmental quality. The combination of a rising tide of pollution, the loss of buffer areas and dwindling biodiversity has essentially ruined the marine life and the livelihoods based upon it. Such a problem has been a concern to many interested parties, especially to coastal communities whose livelihood relied upon the continued integrity of this natural resource. Inefficiencies in allocation and use of natural resources and on-going degradation of critical ecosystems have essentially raised the question of whether the current level of resource utilization is anywhere near the sustainable level. The response to this question will put in perspective the type of measures and strategies needed to generate an appropriate plan and management regime for the coastal zone in question.

3. Anthropogenic disturbances

Human impact has been the primary cause of present day environmental crises. Major components of the environmental crisis related to coastal resources include the

loss of biological diversity, marine habitat fragmentation and alteration, the depletion of mangrove forests for housing or conversion into aquaculture farms, the destruction of highly-productive coral reefs, commercial fish stock depletion, coastal and offshore resource degradation through pollution from land-based activities, and the emission of greenhouse gases which affect atmospheric and oceanic patterns (see among others: Nurkin, 1994; Hutchings and Myers, 1994; Brown *et al.*, 2002; Nontji, 2002; Bengen and Dutton, 2004; and Christie *et al.*, 2005).

Agenda 21, Paragraph 17.4 states that "Many of the world's poor are crowded in coastal areas". Such conditions can clearly be observed in Indonesia. The fishing community is probably the largest group of disadvantaged coastal communities in Indonesia. These are the people who depend on inshore stocks of fish and invertebrates and low-technology to make a living at or just above subsistence level. The majority of fishing communities live under the poverty line. Fishing families are identified among the lowest income groups in Indonesia, with little security in their jobs (Nikijuluw, 2002; Yusran 2002).

The benefit of lucrative development activities taking place in a coastal zone, such as oil and gas production, tourism, shrimp aquaculture, mining, and industry, does not accrue to the local communities, but tends to benefit outsiders or the central government (Dahuri *et al.*, 1996; Dahuri, 2003). There is evidence that suggests that poverty is among the primary causes of the degradation of coastal environments in Indonesia, and poor people of coastal communities also have to absorb the brunt of the pollution-related health hazards associated with rapid industrialization of coastal areas (Dahuri, 2003; Dutton, 2004). All these are imminent threats to sustaining coastal communities. ICM therefore faces the challenge of improving the livelihood of coastal fishing communities.

2.4.2. Implementational/Managerial Constraints

"Management" is meant to be a proactive exercise: anticipating potential environmental problems and basically trying to prevent them from occurring (Jorgensen, 1991 and Borgese, 1998)). However, in reality, environmental management tends to be reactive, which means responding to problems when they have become serious enough to cause social economic impact rather than advocating a well-structured plan for anticipative measures (Bryant and Wilson, 1998). A balance

between the two possible approaches might be achieved by developing and implementing long-term environmental policies which anticipate future conditions and, at the same time, implementing short-term policies to address urgent calls over resource degradation (Japan Environmental Council, 2005).

The long-term policy is meant to address the root of the problems behind all the symptoms of environmental crises that have occurred, whereas the short-term policy is intended for site-specific rehabilitation to stop resource loss and to recover some of the former productivity and ecological functions of a particular coastal area. Kay and Alder (1999) suggest that long-term planning of a coastal area should involve determination of optimal uses of its resources within the next 25 to 50 years, which will give some security to future activities in the area. Success achieved by such a policy is very much determined by recognition of potential constraints towards a smooth process of its implementation. An ICM programme requires specific milieu and support systems to be able to attain its goals effectively. Such support includes capable planners, managers and support staff; sufficient financial support; adequate technological support; and the availability of required data to manage the programme. In regard to this, the following will briefly discuss the managerial constraints that can potentially impede the progress of an ICM programme.

1. Skills and knowledge of human resources

There is a critical need at present to improve the level of skills of professional planners and managers to promote coordination, integration and rational management of coastal resource development. Dutton (2004) observed that a crucial constraint to implementing ICM in a developing country like Indonesia is the shortage of skilled human resources required to carry out coastal resource inventory and environmental impact assessments; formulate planning and management approaches; implement, monitor and evaluate integrated development programmes or projects; and enforce regulations. In addition, there is also a lack of technical and managerial skills on the part of local community organizations and in the private sectors. Furthermore, there is a skewed distribution of skilled human resources, with a tendency to concentrate only in or nearby major cities. Fauzi (2005) asserted that the shortage of skilled personnel, particularly in the outer islands outside of Java, Indonesia, makes it hard to decentralize planning and management functions to a level where development

initiatives are implemented, and to develop resources in response to local needs and capabilities. These problems are being considered further in the discussions of challenges to and the generation of a concept of sustainable management of coastal resources in chapters seven and eight.

2. Funding resources

Cost-associated constraints very often signify particular problems. Identifying and securing a financial resource is an important first step in ICM implementation. Without adequate financing the prospects of successful implementation are poor. Although not always easy, methods of generating financial support or target funding are relatively clear when the institutional framework for an ICM programme is well established. However, many countries do not have a special coordinating body responsible for ICM implementation. In such situations the question of "who is going to foot the bill?" is becoming crucial. In Indonesia, for example, earlier ICM programmes were implemented as collaborative projects of several ministry departments funded through foreign aid or loans. When the project is finished and the programme needs to be sustained, "any cost associated with future enhancement or follow-up will be covered within existing departmental budgets" (Dahuri *et al.*, 1996). Such an approach may be too optimistic and unrealistic. When the broad objectives and the sizable number of strategies and measures to be addressed through ICM are considered, it is clear that substantial financing measures will be required.

Nevertheless, the importance of financing measures should not be overstated. A successful ICM programme is in fact the one that can sustain itself within the community long after the initiation phase is completed. Therefore, nurturing the stakeholder capability to maintain the programme in self-sufficient and self-reliant ways is more important in the long run. In some respects, money can even have negative impacts on the efficiency of the programme. If an ICM initiative is given substantial funding then a step backwards is taken in the implementation of the ICM initiatives. The stakeholders become too involved in managing the money as opposed to focusing on an integrated approach dealing with the environmental issues. In conclusion, money is necessary for the success of programme, especially at the initiation phase, but excessive financing will detract from the objective of the original initiative.

3. Availability of appropriate data and technology

Competent management of a complex ecosystem subject to significant human pressures cannot occur in the absence of science and technology. GESAMP (1996) pointed out that science and technology in support of ICM must be undertaken within structured goals for solving problems. The nature of the coastal area as the place of intense convergence of various ecosystem and human uses with large numbers of parameters to observe makes it almost impossible to effectively manage the area without relying on technology such as remote sensing and computerised databases. Unfortunately, this is the obstacle faced by many developing countries in their efforts to manage their coastal areas. Capability in science is closely related to the availability of skilful and trained human resources; availability of technology depends upon both: trained individuals and financial support. Both are typically beyond the capacity of developing countries to provide.

It has been suggested that in a developing country like Indonesia, where the technology and knowledge to support provision of a well established coastal profile may not be available, it can start at least with a simpler range of biological and physical baseline data (Dahuri *et al*., 1996). From the ICM perspective, lack of baseline data, such as the coastal profile and atlas of particular region, has been an impediment to construct a national strategy for marine conservation and the maintenance of marine biodiversity (Woodroffe, 1995). The available information on the extent and condition of Indonesian coastal resources and their economic significance is neither comprehensive nor reliable, as suggested by Tomascik *et al*., (1997), and more recently by Christie *et al.* (2005).

While coastal resource planners and managers are obliged to base their actions on the best available information, very often they must function with incomplete and inadequate data. In such situations intuitive decisions often have to be made and the effectiveness of management is compromised. Lack of ecological baseline data also reflects deficiencies in monitoring of resource conditions, and the lack of feedback necessary for evaluation and programme revision. It is the lack of reliable coastal profiles which has also been responsible for encouraging the conversion of economically and ecologically valuable coastal ecosystems into monospecific use, such as the conversion of mangroves into shrimp-ponds. Ignoring such a problem will

only serve to encourage unwise and unsustainable exploitative management practices resulting in marine and coastal ecosystem degradation such as coral reef destruction, mangrove clearing, and overfishing.

2.4.3. Political Constraints

The ICM framework is characterized by comprehensive assessment, setting of objective, planning and management of coastal systems and resources, while taking into account traditional, cultural and historical perspectives and conflicting interests and uses (GESAMP, 1996; and Brown *et al.,* 2002). The primary objective of ICM, as Cicin-Sain and Knecht (1998) stated, is to achieve an optimal balance between environmental protection and economic and social development. While it is critical to understand the biological, physical and technological aspects of the resources, it is equally important to comprehend the various economic attributes and social, political and institutional forces that influence the behaviour of the various stakeholders and managers.

To be effective, ICM requires the coordinated allocation of resources to different activities to maximize their contribution to sustainable development. Planning for ICM therefore needs negotiation, arbitration and legislation to encourage a mix of activities that will promote sustainable development in the coastal area as a whole. Such a process must be coordinated through existing institutions with related jurisdiction to coastal resources. As a management programme, ICM needs to respond to dynamic forces of political interests among stakeholders of coastal resources. A review of the contemporary works in ICM shows there are three main factors related to the political effectiveness of ICM. These are: lack of institutional arrangements, problems of integration, and lack of legal compliance.

1. Institutional arrangements

Institutional arrangements for ICM refers to the composite of laws, customs, and organizations established by society to allocate scarce resources and competing values for a social goal, to facilitate the management of the coastal environment and its resources (Sorensen *et a l.,* 1984). Kay and Alder (1999) suggested that ICM managers should first attempt to fit the programme into the available governmental structure in a manner that causes the least disruption of present institutional

arrangements. However, for a full-scale, comprehensive programme, it would be desirable to create a new agency with governmental support, power and resources necessary to perform its function.

Many coastal countries do not have the luxury to provide a single institution with overarching jurisdiction to deal with an ICM mandate. Instead, due to the legacy of earlier sectoral regimes, many agencies have interests in coastal areas. With no single agency responsible for the coastal zone, there tends to be overlap between them. Until recently in Indonesia, there were at least 17 agencies involved in the coastal areas. Hence, coordination of jurisdiction and efforts is a major challenge (Sloan and Sugandhy, 1994). A more recent assessment indicates that, at policy level, the situation has been improving as a result of institutional strengthening at the national level and because of a more settled and improved political atmosphere. (Fauzi, 2005; and Pahlevi, 2005). However, there has also been suggestions about weaknesses at local and community levels (Prasetiamartati, 2007). The inadequate institutional frameworks for management at local level can create confusion and conflict. Among them, there are conflicting land and resource use demands reflecting the multi-sectoral approach to resource management. Furthermore, the available institutional arrangement in Indonesia does not support the enhancement of community-based co-management efforts (Nikijuluw, 2002).

2. Problem of vertical and horizontal integration

Integration means to unify, to put parts into a whole, that is bringing together all the constituent elements. The term integration is overworked and has been used differently by various disciplines. For example, integrated farming employs the term in a predominantly technical sense, where the focus is on the use of an output or by-product from one process as input into another process. Within the context of ICM, integrated management refers to management of sectoral components as parts of a functional whole with explicit recognition that human behaviour (not the physical stocks of natural resources such as fish, land or water) is typically the focus of management (Kay and Alder, 1999).

Cicin-Sain (1993) described integration as a continuum of policy which, in the ICM application, should progress from less integrated to more integrated. In the process of becoming integrated, coastal management may progress from being

fragmented, through communication, to coordination, to harmonization, and eventually to achieve integration. At this integration stage, formal mechanisms are needed to synchronize the work of various units which lose at least part of their independence as they must respond to explicit policy goals and directions. To put such mechanisms in place, institutional rearrangement is often necessary. A wide range of aspects are expected to be covered within ICM, including: the spatial, functional, institutional, legal, policy, knowledge, and participation dimensions.

Aside of being the key concept in ICM, as stated by Cicin-Sain and Knecht (1998), achieving integration is ultimately the major challenge and most difficult task of this management approach. The basic question for integration is how to get all the responsible agencies, the private sector, and coastal communities to agree on the most important issues and then work together to implement appropriate solutions. Stojanovic *et al .*, (2004) and Christie *et a l.*, (2005) observed that integration of multiple agency interests into a single programme is difficult. The nature of agencies to integrate is not always similar. It is common to have "strong" and "weak" agencies working together and there will be unwillingness in certain parts of the bureaucracy to give-up their full authorities over particular jurisdiction and control. Every agency will try to protect their political influence and they will naturally defend their supposed territory and only yield authority and related prerogatives when presented with the difficult choice. Therefore, it is entirely possible to see several public agencies perceiving ICM as a problem rather than an opportunity. Difficulties encountered in the process of integration will lead to other possible problems such as lack of coordination, possible resistance to government intervention, and eventually poor performance of resource management. In Indonesia, the problem of integration appears to take its toll on the effectiveness of resource planning and management process.

3. Legal compliance

The number of laws and regulations in existence to support an effective implementation of coastal resource management in Indonesia is sufficient (Patlis, 2005; Dirhamsyah, 2006). However, the problem has been inadequate actions to target and enforce these regulations. For example, the violation of *Environmental Law* No. 23/1997 concerning environmental standards by most industries along the north coast

of Java, inappropriate mangrove conversion scattered all over Indonesian coastal areas, massive pollution discharge by industries in Java and Sumatra, coral mining, illegal and destructive fishing methods, and many other environmental abuses occur regularly. Such violations are evidence of the weak compliance to legal instruments. This situation however, can not be separated from the external force played in the society. Indeed, the supremacy of law is yet to find its place in the presently changing structure of Indonesia.

The present situation of weak enforcement and inadequate levels of compliance over necessary legislation to protect coastal resources is a fertile medium for particular profit-oriented, powerful stakeholders. These people benefit directly from their assault on coastal resources such as blast fishing, cyanide fishing, coral mining, or illegal mangrove conversion. With their strong financial resources, there is every possibility these people will play "money politics" with local officials to obstruct law enforcement. The only way to stop this is to empower the local community and strengthen the legal compliance processes. Effective management has to be supported by strong political will and adequate institutional structures. It must be based on long term commitment for environmental education programmes to raise awareness and to transform deep-rooted undesirable behaviours into attitudes and behaviours that respect the resource sustainability.

2.4.4. Critique to the Theory of ICM

The previous section presented an assessment of ICM mainly from operational/implementational perspectives. This assessment tends to perceive ICM as an instrument that can be applied to address the environmental crisis in coastal areas. Therefore, the assessment was mainly dedicated to addressing the constraints and challenges faced in the field for ICM implementation. Beyond this however, there is a question on whether ICM is the appropriate instrument to apply to resolve coastal resource problems. This question is related to the basis of ICM philosophies as well as the paradigm chosen in its implementation.

Karen Nichols (1999) identified the harm done through ICM implementation in Sri Lanka through the coral reef rehabilitation effort. She notes that "the resulting regulatory regime [based on the ICM paradigm] facilitates the opening of coastal zones worldwide to aggressive state and global capital investment. By promoting the

overhaul of existing social and spatial organization in coastal zones and by asserting the primacy of resource access for modern economic interests,… ICM may introduce more rather than less social conflict and ecological degradation" (Nichols, 1999. p. 398). Furthermore, after almost a decade of ICM initiation in Indonesia, Ian Dutton (2004) admitted that "Current approaches to marine resource development and management are failing to take account of the wider social equity and ecological dimensions of sustainability" (Dutton, 2004. p. 177).

The ICM concept was constructed at the global level by an international network of scientists who formulated the theoretical as well as practical basis of ICM theory. These are developed into packages of "prescriptions" ready for implementation in countries needing assistance (Olsen, 2003 and Siry, 2006). The worldwide recognition of sustainable development further advance the implication of interdisciplinary approach in addressing problems of coastal resource development strategy, especially problems that focus on the biological, economic and social impacts of regulation policies. ICM proponents focusing their attention on fast degrading coastal and inshore marine environments in many parts of the world, and although there is no such thing as a "one-size-fits-all" model of coastal resource management, there appears to be a growing consensus of a general model which emphasizes the suitability of the integrated principles and approaches of ICM to most coastal countries. Table 2.1. presents a brief comparison on implementation of ICM between developing and developed countries.

While ICM proponents may argue for a holistic approach in its field application and techniques, there are strong indications that the ICM regime has mainly been prescribed as a coastal development instrument offered through a top-down mode (ADB, 2000). Although the proponents of ICM claim that the most complete approach, and therefore closest to the ideal one, is ICM and would therefore suggest ICM as the right strategy to implement, it is also clear that ICM has many weaknesses and disadvantages. This is mainly due to the inherent nature of ICM as a top-down approach which has mainly been implemented without careful analysis of alternative strategies available. Further understanding of the relative strengths and weaknesses of particular approach is an important step to comprehend the possible implication of such an approach.

Table 2.1. A comparison of ICM implementation in Developed Countries and Developing Countries abstracted from Cicin-Sain and Knecht (1998) and Olsen (2003).

	Developed Countries	**Developing Countries**
Reasons for initiating ICM	Economic opportunities	Environmental issues
Tourism being promoted	Marine recreation	Ecotourism
Approaches used	Own legal frameworks	UNCED Prescriptions
Governance capacity	Stable, harness rule of law, and stringent zoning control	Low capacity and control
Speed of coastal change	Restrained	High growth of unplanned urban development
Coastal management funding	Subsidies, incentives from national and provincial government	No sustained source of fund in provincial and municipal government. Thus, rely on external funds

As Nichols (1999) stated, the emergence of national ICM programmes worldwide in the 1980s, and further proliferation of many ICM programmes until present, has been facilitated by a vast network of inter-governmental and non-governmental organisations (NGOs), as well as individual ocean research and policy institutes. This global network has persistently been promoting the ICM concept through problematisation of coastal resource utilisation and promotes the concept through the idea of sustainable development. One example of the inherent top down nature of ICM packages is offered in Box 1 and gives a sense of how this problematising has been addressed. This is based on my own experience of having been involved in several ICM-related implementation projects in Indonesia. This story reveals the dilemma faced in the field and the problematisation that occurred in respond to these “packages” of Institutional Development and Capacity Building. Thus, the important question to be answered is whether the ICM sustain the challenges of bringing prosperity to local community?

Box 1. To drive or to swim?

Foreign consultants or coastal management experts backed by international funding agencies like USAID or World Bank have been strongly promoting "Institutional Development" and "Capacity Building" as their main prescription to address the ills of coastal communities within the larger theme of the Poverty Alleviation programme in developing countries. Crawford *et al*. (2004) identified that an international assistance project typically contains two main components: infrastructure development and institutional development. In the context of coastal resource management, it generally means technical assistance in the development and implementation of management plans, plus the provision of funds for physical development, and assistance designed to improve those organisations playing roles in the implementation (Chua, 1992). In Indonesia, this mode of operation can be seen in the projects with funding from foreign loan disbursements. Among those related to coastal management are: the currently implemented Coral Reefs Rehabilitation and Management Project (COREMAP) and Marine and Coastal Resource Management Project (MCRMP), and their predecessor the Marine Resource Evaluation Project (MREP) in the late 1980s.

Such prescription is not without reason. Studies conducted to identify obstacles and challenges to the projects to assist the rural communities in addressing the poverty problems have suggested the lack of ability amongst the community to comprehend the problems; moreover, even when people are able to identify their problem, they are still lacking the ability to address or find the solution. This incapability then leads to the conclusion that the lack of formal training within the community is due to the inadequacy of formal institutions to deliver a service that will ensure appropriate execution of necessary tasks.

Therefore, the experts conclude, that there is a lack of power to address the problem. The prescription which then comes out of such a diagnosis is quite predictable: Institutional Development and Capacity Building. This is often followed by inter-related programmes which are derivatives of this policy, such as: Institutional Strengthening, Institutional Arrangements, Enhancement of Legal Instruments, Public Education, Environmental Awareness, and Community Empowerment.

Given the fact that most of the consultants have had a long formal training and higher education compared with the community members who are less likely to have such intensive formal education, then it is quite natural to expect the consultants to provide top-down advice which has been formulated much to their advantage.

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As a practitioner in the field of coastal resource management myself, I have also been drawn into the same paradigm and absorbed a similar perspective. In my lectures to the undergraduates in the Department of Marine Science of the Hasanuddin University where I work, I have always used the following description to illustrate how the community needs to be "empowered" before taking on the complicated task of managing their own natural resources. It is similar to the illustration of people riding in a car. When *the driver* (government) decides to step out and subsequently passes *the key* (management authority) to *the passengers*, it will not work out well because none of the passengers, after a long time of being a passive rider in the car, can juts suddenly take over the steering wheel and start to drive. They will need firstly to learn how to drive and secondly, to know where to go, or at least be able to read and understand directions in the roadmap.

The implications of this illustration in the field of coastal resource management quickly lead us to the conclusion that in order to enable a coastal community to manage its resources, it needs to be empowered by education and training, raising awareness, and gradually introducing them to the concept of Sustainable Resource Management which must have previously been an alien concept to them. It is implied that these will be conducted within the scope of Institutional Development and Capacity Building.

This illustration is rarely ever challenged or questioned. The majority of students listening to this illustration accept the assumption that coastal communities are typically backward, under-educated, unmodernised, and therefore needed to be taught through training to build their capacity. Not until recently, when one of students in my class asked the question: "what if the road taken was not meant for a car ride; what if the intended destination can sufficiently be reached by walking, or might even require you actually to swim? Would you still training the community, or wouldn't the table have been turned the other way around on the 'coastal expert'?" The question suddenly shattered all my convictions about the notion of community empowerment through Institutional Development and Capacity Building.

2.5. CHAPTER CONCLUSIONS

This chapter is an effort to address the question of what constitutes an effective approach to managing coastal resources sustainably. It shows that the top-down approach in resource management, especially in coastal management, has not been able to address and effectively solve the problems of resource utilization in the poor coastal communities of tropical coasts. The challenges faced by the implementation of ICM have been discussed as well as other factors to consider in managing coastal resources sustainably. However, it is not merely the constraints faced by ICM that are a challenge to its smooth operation, but that there are inherent problems related in the ICM paradigm and how it has been prescribed as a "package" of management tool-kits to apply to the environmental crisis in coastal areas. Furthermore, there is also a question on how this "crisis" has been constructed and problematised.

The next chapter will examine bottom-up approaches and questions whether it is merely an alternative or is complementary to those of the top-down approaches. The question of which is better presents a problem. Evidence from the field studies and lessons from literature provide a complex picture that it is unwise to take one side over another. For example, in many instances older-style natural resource management regimes of top-down approach can be effective in decision making. Yet evidence suggesting otherwise is plentiful. Conversely, although bottom-up approaches are more democratic, they often lack the mechanisms needed to accelerate the decision making process or to prevent a chaotic design of the management structure. Nevertheless, evidence is growing and shows that effective management and maximum results are achieved when a bottom-up approach is implemented appropriately. While this observation can not be used as an overarching conclusion, it does serve to frame the plusses and minuses of each approach.

CHAPTER III. COASTAL COMMUNITY LIVELIHOODS AND THEIR IMPACT ON THE ENVIRONMENT

3.1. INTRODUCTION

This chapter discusses the theory and practices of coastal resource utilization through a focus on community livelihood. It is concerned with community-based resource management, and how such bottom-up forms of management address challenges to resource sustainability. Identification of the components and characteristics of bottom-up approaches to managing coastal resources provides grounds for the theoretical framework of my research approach, whereas the analysis of community-based bottom-up practices gives the previous-work context within which my framework sits. The chapter starts with a theoretical review of the literature on livelihoods and on property rights, followed by descriptions of co-management and community-based approaches to resource management. This leads to a presentation of the strengths and weaknesses of different approaches in order to frame the results analysis part of this thesis.

3.2. THE COMPONENTS OF A SUSTAINABLE COMMUNITY LIVELIHOOD

Coastal communities in Indonesia are highly dependent on their surrounding environment for their livelihood. One consequence of this dependence is that natural resource utilisation and its management regime are inseparable aspects of the socio-economic reality of these coastal communities. There has been common agreement in the literature that the major constraints on the sustainable management of coastal resources are mostly institutional, rather than technological (Hardin, 1968; Baland and Platteau, 1996; Ellis and Biggs, 2001; Ostrom, 2005). Thus, comprehension of the dynamics and complexity of institutional arrangements that exist for managing the common-pool resources of coastal areas is a key prerequisite to understanding and for finding answers to my research questions.

Since the main question that motivated this research involves the assessment of the dynamic relation between coastal communities and their surrounding resources, then the livelihood strategies adopted by particular individuals or households in a coastal community are important components for analysis. Therefore, it is important in this chapter to clarify how this livelihood concept is being used and how it is related to other components of analysis in this research.

The idea of 'livelihood' has been a subject of discussion among academics and development practitioners. There is a consensus that livelihood is about the ways and means of 'making a living'. The simplest definition of livelihood stems from the work of Robert Chambers and Gordon Conway (1992, p.3): 'a livelihood comprises the capabilities, assets and activities required for a means of living'. Ellis (2000) suggests a definition of livelihood as: the activities, the assets, and the access that jointly determine the living gained by an individual or household. The most widely accepted definition of a sustainable livelihood was presented by Carney (1998, p.4): 'a livelihood comprises the capabilities, assets (including both material and social resources) and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from stresses and shocks and maintain or enhance its capabilities and assets both now and in the future, while not undermining the natural resource base'.

Soussan *et al* . (2003) identified four main characters of livelihood. They described livelihoods as dynamic, complex, being influenced by external forces, and being the conscious choice of people who perform them. The concept of livelihoods is dynamic, recognising that the conditions and structure of people's livelihoods changes over time. Livelihoods are complex, with households undertaking a wide range of activities. For example in a coastal community, people are not just fishermen, or farmers, or labours, as they often have multiple occupations. Furthermore, livelihoods are influenced by a wide range of external forces, including social, economic, political, cultural, environmental, and institutional both within and outside the locality in which a household lives. All these are beyond the control of a fisherman's family. Lastly, people make conscious choices through deliberate strategies in ways that best utilise whatever assets they have to maximise their opportunities and minimise their risks. Therefore, in livelihoods analysis, the poor are viewed as active strategists rather than passive victims or recipients (Haan and Zoomer, 2005). These choices are mainly made at the household level (Ellis, 1998).

Carney (1998) identifies five *Capital Assets* that people commonly draw on as the basis for their livelihoods, namely: human, physical, social, natural, and financial. Livelihoods are built from a series of choices over the use of these assets. Based on the choices made, members of the household will undertake a series of *Livelihoods Activities* or *Strategies*, such as; fishing, planting mangroves, cultivating shrimps, or working as a boat labour. These activities will generate income for the households in goods, services and cash, which is then allocated into four main directions: for consumption, social payments, investment, or re-circulated back as inputs into livelihood strategies (Soussan *et al.*, 2003).

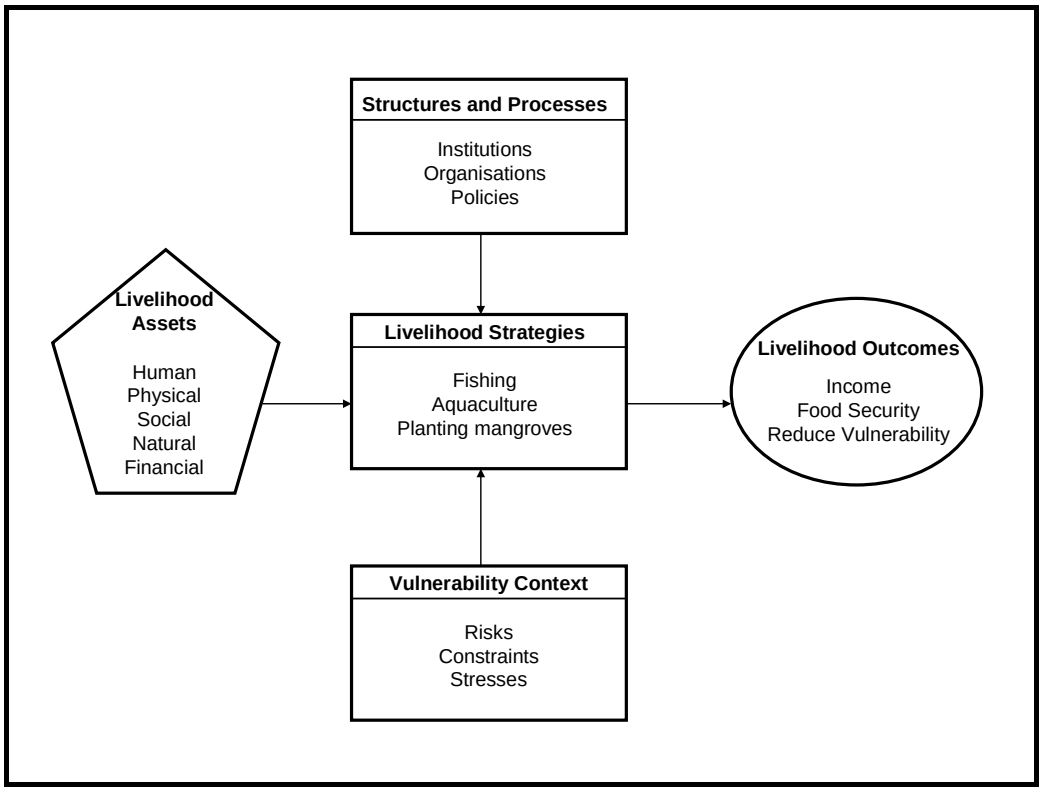

Figure 3.1. The components of Livelihood Analysis adapted from DFID (1999) and Ahmed *et al.*, (2009).

Many local and external factors influence livelihoods, including markets, the physical environment as well as the social and political environment. These factors can be considered as the *Structures and Processes* that influence *Livelihood Strategies*. Chambers and Conway (1992) pointed out that these features are inherently dynamic and livelihoods are vulnerable to shocks and trends which are beyond the household's control. The character of these external forces represents the *Vulnerability C ontext* within which the livelihood systems of different households

develop. These five components of livelihoods analysis and their dynamic relations are presented in a diagram in Figure 3.1.

Another important aspect in the selection of strategy for livelihood is whether it is a sustainable option. A livelihood is considered sustainable when it can cope with and recover from stresses and shocks, and maintain or enhance its capabilities and assets, both now and in the future, while not undermining the natural resource base (Carney, 1998). Scoones (1998) offered five key indicators to assess the achievement of sustainable livelihoods, namely: (a) poverty reduction, (b) well-being and capabilities, (c) livelihood adaptation, (d) vulnerability and resilience, and (e) natural resource base sustainability. DFID (1999) proposed a Sustainable Livelihood Approach (SLA) as a guide to assess the poverty-reduction policies in low-income developing countries. Ashley and Carney (1999) described SLA as a way of thinking about the objectives, scope and priorities for development, in order to enhance progress in poverty elimination. The SLA can therefore be used in different ways, according to the objective of the programme. In development practices, the SLA is being used as a process tool to enable participants in development programmes to identify key constrainits and opportunities for development intervention (Haan and Zoomer, 2005). Ahmed *et al*., (2009) applied the SLA framework to understand the role of prawn post-larvae fishing activities to the livelihood of a Bangladesh coastal community. Neiland and Bene (2004) point out that the SLA is prominent in recent development programmes that aim to reduce poverty and vulnerability in communities engaged in small-scale fisheries and aquaculture.

Sustainability of resources in coastal areas is among the most difficult state to achieve due to the complexity of components involved. For example, artisanal fisheries, commonly operated by individuals in coastal community, involve an inherent interplay between humans and the natural world, both as an economic activity as well as socio-cultural foundation for people and community (Johannes, 1978; Garcia and Charles, 2008). Therefore, in doing assessments of sustainability in coastal areas, it is desirable to pay attention to the dynamic nature of the relationship between human activities, the resource, and the norms and mechanisms that maintain the relationship in balance. Charles (1994) offers a framework for sustainability assessment based on three fundamental components of resource sustainability, along with a fourth component, institutional sustainability, which maintains the dynamics of the interactions of the fundamental components. Figure 3.2 presents a diagram of this

framework, which will also be the basis for further assessment in later part of the thesis, such as in Chapter 7. North (1990) specifically emphasised the importance of institution in reducing the collection action dilemma normally faced in an open economy. Situation like this, as Hoff and Stiglitz (1993) also had pointed out, often found in a coastal community that is trying to penetrate market using their local resources but with very little knowledge of market dynamics.

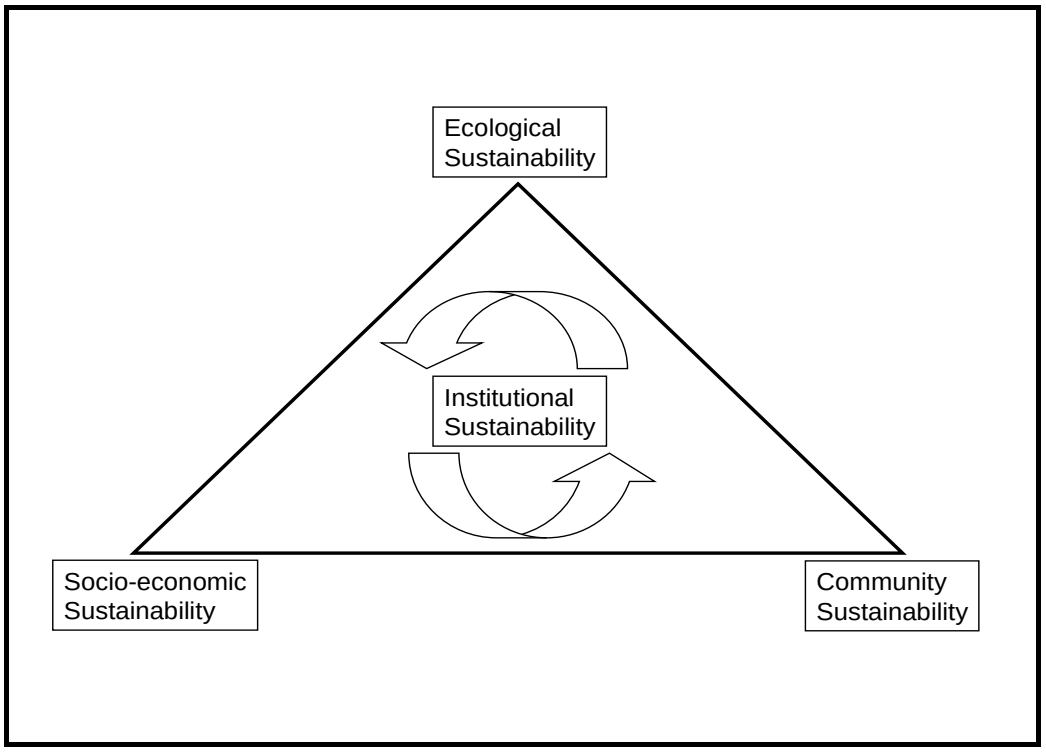

Figure 3.2. A framework for sustainability assessment depicted as a 'Sustainability Triangle' as suggested by Charles (1994). The framework is based on three fundamental components of sustainability: socio-economic, ecological, and community. In the centre institutional sustainability dynamically interacts with each of the component. (Source from Charles, 1994. p.205).

Literature on natural resource management from the last two decades exhibits a growing consensus that co-management arrangements between indigenous local populations and government institutions can prove appropriate for conserving resources and promoting socio-economic well-being, in particular, at a local level (e.g. Ostrom, 1990; Zerner, 1994; Berkes, 1996; Nikijuluw, 2002). Examples of the involvement of local communities and the important roles they play in managing the environment and resources in their vicinity abound world-wide. These include the

practice of *Oyabun-Kobun* in Japan (Kalland, 1995), *Amo-Tauhan* in the Philippines (Yusran, 2002), and a series of traditional property rights applied in South Pacific countries (Ruddle, 2000) including *Taiapure* in New Zealand (Hemmingsen, 2004).

The local users of inshore fisheries in the Pacific basin, from Samoa to Japan, have applied property rights systems for centuries. These systems range from the simplest property rules, which include restrictions of fishing seasons, gear use, and fish size, to more complex rules which cover rights of management, exclusion and alienation. Although the rules used to enforce or to protect the traditional property rights of communities are commonly unwritten, informal or even covert (Johannes, 1978), according to Ruddle (1994) such property-right systems have proved very powerful in controlling users in their exploitation of coastal and marine resources and in safeguarding the sustainability of those resources. Andersen (2001) observed that when fishermen hold property rights there is much less of a tendency for them to over-exploit the fish. Evidence from other places shows that stock are commonly over-exploited where traditional property systems have been replaced by open-access regimes (COREMAP, 2003; Chozin, 2008)..

In Indonesia, many communities are recorded as practising traditional systems of managing local resources, such as the practise of *Awig-awig* in Lombok, *Subak* in Bali, *Panglima Laot* in Aceh and northern parts of Sumatera and *Sasi* in the Moluccas region (Nikijuluw, 2002). These systems mainly revolve around agreements as to how natural resources in their vicinity are to be shared within the community - resources which can be in the form of fisheries, forests, freshwater and many other resources. These systems are generally based on local traditional ecological knowledge, acquired through living in contact with the natural resources of a particular area over many generations (Kay and Alder, 1999).

For a long time these systems have been known to serve as a way to govern natural resource use as well as being useful in mediating conflict, adopted as regular norms, for creating self-identity, and as a part of the local way of life. However, like many other authoritarian rules that strive to maintain a strong-centralised authority, the Government of Indonesia in the past had been reluctant to officially recognise the practice of traditional institutions. Only in 2004, through the implementation of the Regional Autonomy Act No. 32/2004 (GoI, 2007), have communal property rights eventually been legally recognised in this country.

Despite the numerous examples of local and/or traditional regimes for managing natural resources, not all of these practices have succeeded in maintaining the sustainability of the resources they govern, and subsequently the livelihoods they are supposed to protect. The robustness of any local regime is measured by, according to Ostrom (1990), whether or not it survives challenges and changes over time and if it is still able to deliver the expected results or benefits to the groups that are practising it. It is therefore crucial to ask: what are the actual driving factors which determine the success or failure of a local initiative?

In order to answer this question, it is essential to first understand how resource governance and management concepts are applied in the coastal realm. Coastal resources in general cover a continuum from terrestrial-sourced materials, to intertidal ecosystems, to marine fisheries and other environmental services within a defined costal zone (refer to Figure 2.1 in Chapter 2). The state of coastal resources, being available in an open, non-private space, essentially means that they exist within the 'commons'. Therefore any effort to govern or manage them has to perform within the context of 'common-pool resources'.

In order to discuss the attributes required for successful management of common-pool coastal resources, it is important to initially understand the characteristics of property rights. That is, the terms *resource*, *property right*, *property regime* and *common-pool r esource* need to be distinguished. Gibbs and Bromley (1989, p.23) define *resources* as "those components of an ecosystem which provide goods and services useful to man" whereas Grima and Berkes (1989, p.12) define them as "assets for the creation of human satisfaction or utility". Since a resource is almost anything that may be used to fulfil the needs of human beings or other organisms, then a natural resource is a material that has economic or social value when extracted from its natural state. In short, resources are cultural appraisals; they are identified by groups with particular experiences, knowledge or needs (Mather and Chapman, 1995). Therefore, the state of a resource is defined more from the users' perspective rather than by the physical attributes that construct it.

Buck (1998, p.3) defines *property* as "an aggregate of rights which are guaranteed and protected by the government" while Bromley (1992, p.4) defines property as "a claim to a benefit (or income) stream, and a property right is a claim to a benefit stream that some higher body – usually the state – will agree to protect through the assignment of duty to others who may covet, or somehow interfere with,

the benefit stream". In relation to this, Ostrom and Schlager (1996, p.130) define *property r ight* as "enforceable authority to undertake particular actions related to specific domain" In this context, *property r egimes* are the set of rules (laws, regulation, customs) that define property rights (Buck, 1998).

In general, four categories of property right regimes are recognised. The first is *Open Access*, which provides free access for all, with property rights assigned to no particular party. Second, *State P roperty* (*res publ ica*) exists where management control is held by the nation state or the crown. Third, *Private Property* (*res privitae*) is privatisation of rights through the establishment of individual or company-held resources. And fourth, *Communal Property* (*res communes)* is where the use rights for resources are controlled by an identifiable group and are not privately owned or managed by governments. This latter category is, in effect, collective ownership. Table 3.1 presents a summary of the strengths and weaknesses of these four property rights regimes in relation to managing natural resources.

After reviewing the four types of property rights, it is important to understand the relationships that exist between users and their access to natural resources, and how the users exercise their rights for such access. Ostrom and Schlager (1996) classified property rights over natural resources into five types, namely: *rights of access*, *withdrawal*, *management*, *exclusion* and *alienation*. *Right to access* is the right to enter a defined physical area and enjoy non-extractive benefits. For example, when people pay or gain access into a park to enjoy services produced by the park this may be classified as a *right of ac cess*. Such rights entitle holders to the enjoyment of the park but do not allow them to perform any extractive activities. Park users also have a duty not to interfere with the rights of other people to enjoy the park. A similar example is the right given to fishermen to enter or pass through a nearby marine protected area without actually fishing in that area.

A *withdrawal r ight* is a right to obtain a resource unit or product from a resource system. The resource user who holds this right may have the authority to harvest resource units at a certain location. An example is fishermen who have license to fish within a particular fishing ground – that is, they are not only authorised to enter the area but also to capture and remove fish from there. Another example is a village community that holds withdrawal rights for an otherwise-protected coral reef – that is, the community members alone have the authority to harvest restricted fish products. This right may include a restriction authorising the community members to take

benefits only where they are for meeting subsistence needs and not for commercial or trading use.

Table 3.1 Summary of the strengths and weaknesses of the four property regimes known in natural resource management (adapted from Berkes, 1989).

Type of Property Rights Regime	Strengths	Weaknesses
Open Access (res nullius)	▪ Equal access rights to the resource for all.	▪ Every one has equal access but not equal means to take advantage of the resources, and no one has the legal ability to exclude other potential user. ▪ Previous experiences had shown this regime does not work once the exploitation level exceeds the ability of the stocks to sustain themselves.
State Property (*res publica*)	▪ Government is assumed to act in the public interest and to have scientific understanding of the ecological systems involved. ▪ Government can induce social behaviour to encourage optimal use of resources. ▪ Government can better address the resource degradation problems through issuance of decrees prohibiting entry to state property.	▪ This regime has led to continued resource degradation worldwide. ▪ This regime tends to underestimate the capability of local community to manage a resource and to overestimate the ability of governments to act in the public interest. ▪ Under-staffing or insufficient government budgets make it hard to implement effective resource management regimes.
Private Property (*res privatae*)	▪ This regime allows for social and legal sanctions to exclude outsiders.	▪ There is a tendency for the owners to earn benefits from the resource on the basis of the principle of the highest return for the lowest possible capital outlay.
Communal Property (*res communes*)	▪ Community owns certain natural resources. An individual can hold use rights but only with the permission of an association or community leaders. ▪ This regime has structured ownership arrangements within which management rules are developed, user group size is known and enforced, incentives and sanctions exist for co-owners to ensure compliance.	▪ A breakdown in compliance by co-owners may be difficult to prevent. ▪ If government does not value the interests of the owners, it will not respond to threats to a resource. ▪ Users often cannot manage the resources entirely by themselves as they may be unable to find a complete solution to the problem they are facing.

Management r ights are the right to regulate the internal use pattern and transformation of resources. The latter may be exercised by setting a resource's improvement status. They include rights to modify or to transform the resources. Examples include the rights to restrict what kinds of fish can be harvested and what fishing devices can be used in this process, or rights to set the size or numbers of trees that can be cut down. Put simply, how, when and where resource users are able to make use of the resources are determined by those who hold the management rights.

A *right o f excl usion* is a right to determine who may access resources. Examples include the right to define which group of fishermen are allowed to harvest within a particular fishing ground or the right to define which villagers may enter particular forest areas.

The last category of rights to natural resources is *right of alienation*. That is, a right to transfer a part, or all, of the management and exclusion rights to another individual or group. Transferring the rights can mean selling or leasing the management and exclusion rights. The individual who has transferred the right will no longer have the authority to the resources.

Schlager and Ostrom (1992) divided natural-resource right holders to five classes: authorised entrants, authorised users, claimants, proprietors and owners. An *authorised entrant* is a resource user who may only access a resource system without rights to harvest the resource. Somebody who pays an entry fee to enter a marine national park has no right to harvest fish, coral or anything else there but can enjoy the underwater view or other activities that do not affect the resources in the park. Similarly, people may be authorised to enter and enjoy a forest park without rights to harvest timber and other forest products.

In contrast, *authorised us ers* have authority to simultaneously access and withdraw resource units. Examples of these property right holders are commonly found in fishery management systems. In Indonesia this exists for fishermen, particularly those involved in commercial fishing, whereby individuals may hold the rights to access and fish within a certain area. They hold fishing licences granted by the state according to which they can employ defined fishing devices to catch fish. They do not have rights to the management, exclusion and alienation of the resources (Ruddle, 1998).

Claimants hold the two first rights described, plus management rights. The gill-net fishermen of Jambudwip, South India, are a popular example of this type of rights holder (Ostrom and Schlager, 1996). They have a set of withdrawal rules that enable them to coordinate their use of the fishing ground. Saad (2003) reported that a similar system occurs among the *Bungka T oddo* fishermen in the midland Lake Tempe in South Sulawesi.

Proprietors are individuals who hold authority to participate both in management and in exclusion. Proprietors are authorised to determine who has access and how individuals may use resources. However, they are not allowed to transfer their collective-choice rights. The traditional fishermen of *Trochus* molluscs in Kei Island of Maluku, Indonesia are examples of proprietors. According to *Sasi* systems, a customary law found in Maluku societies and prevailing in the fishing-ground, forest and reef systems, a *Trochus* fisherman has rights to manage and exclude other potential beneficiaries from that activity. The head of a village, through a village council, determines the rules around who may be involved in the *Trochus* fisheries, when and how the villagers harvest, and to whom they sell the harvested *Trochus* (Thorburn, 2001).

Table 3.2 Matrix showing the status of a stakeholder with regard to the bundle of rights entitled to that position (Ostrom and Schlager, 1996).

Positions / Bundle of Rights	Owner	Proprietor	Claimant	Authorised user	Authorised entrant
Access	√	√	√	√	√
Withdrawal	√	√	√	√	
Management	√	√	√		
Exclusion	√	√			
Alienation	√				

Owners hold all the above rights (rights to access, withdrawal, management and exclusion) plus the alienation rights, which include the possibility of transferring their rights. Table 3.2 presents a matrix relating each user and their associated rights.

In general, there are two attributes of resources: *exclusion* and *subtractability*. Exclusion is the difficulty or feasibility of excluding others from using the resources whereas subtractability is the degree to which one appropriator's use of the resource

diminishes the amount left for another. The excludability character of a resource refers to the degree of effort needed to stop or eliminate chances of others from gaining access to the resources. The subtractability attribute refers to whether or not a person's use of the resource will reduce the availability of resources left for others to use. In fisheries for example, the amount of fish caught by a fisherman will reduce the availability of fish left for others to catch. On the other hand, somebody who enjoys a walk in the park at one time does not necessarily reduce the enjoyment for others to use the park at another time.

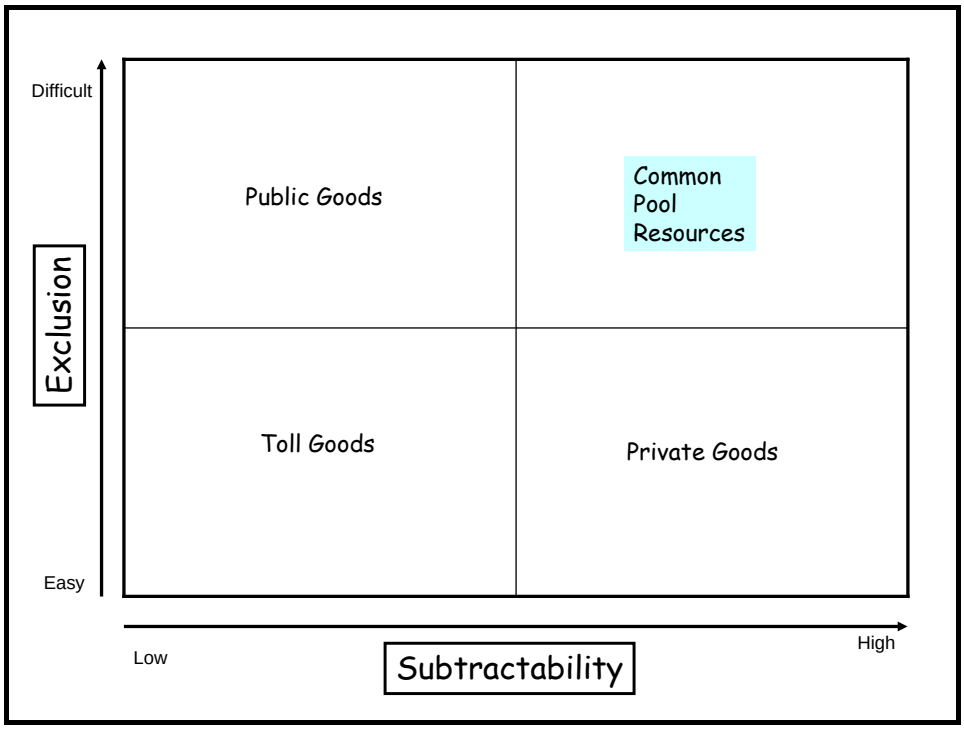

Figure 3.3. Four types of goods based on the resource attributes of exclusion and subtractability (adapted from Buck, 1998. p.5).

Figure 3.2 shows that, based on these two attributes, resources can then be divided into four types of goods: a) *private goods*, which are easy to exclude others from and which have a high subtractability; b) *toll goods*, easy to exclude but low subtractability; c) *common pool resources*, difficult to exclude with high subtractability; and d) *public goods*, difficult to exclude but low subtractability. Each type of good implies a different kind of property right. *Private* and *toll* goods include the direct implication of excluding others and therefore do not create as much ambiguity or complexity in their management. In contrast, for *public goods*, although

exclusion is difficult the subtractability of the resource tends to be low. By far the most complex situation exists for the management of 'common-pool resources' (CPR) because this is a class of resources for which exclusion is difficult and joint use involves subtractability (Berkes, 1989). Oakerson (1992) includes *indivisibility* as an additional attribute of CPR. Indivisibility means when a 'resource movement' characteristic is present (such as water flow or fish migration), this makes the physical boundaries of the resource soft and permeable. This, in turn, adds further difficulties in managing CPR. Coral reefs and mangrove forests, along with their associated flora and fauna, are examples of CPR which have these management difficulties.

In several literature sources, the acronym CPR has been used interchangeably as an abbreviation for both Common Pool Resources (let's call this CPR) and Common Property Resources (CPrR). Although it may be correct in syntax terms for both to be 'CPR', the two terms actually represent different meanings within the realm of managing the commons. It is therefore quite critical to define the difference between the terms clearly in natural resource management terms.

Common Pool Resources or CPR refers to the physical state or availability of stock from which humans draw utility, whereas Common Property Resources or CPrR refers to social institutions – such as the management regime – and not to any inherent natural or physical qualities of the resource. CPR are natural or human-made facilities or stock that generates flows of usable resource units over time. Most natural resources can be classified as CPR. This comprises one of four general ways of classifying the goods and services that enter into transactions (Ostrom and Schlager, 1996) as can be seen in Figure 3.2.

Buck (1998, p.5) identifies CPR as "subtractable resources managed under a property regime in which a legally defined user pool cannot be efficiently excluded from the resources domain", while he describes *commons* as the resource domains in which CPR are found. McKean (2000, p.28) defines CPR as "goods that can be kept from potential users only at great cost or with difficulty (excludability), but that are subtractable in consumption and can therefore disappear". Furthermore, as common pool goods are subtractable in consumption (such as in 'private goods'), this indicates that they can also be depleted. Without institutional mechanisms that address the two resource characteristics of excludability and subtractability, CPR are essentially open-access resources available to anyone. These resources could therefore be very difficult to protect and easy to deplete.

On the other hand, the term Common Property Resources (CPrR) relates to a group of resources which are under particular control regime for their use. McKean and Ostrom (1995) defined the term common property or common property regime (often used to refer to a property rights arrangement) as a group of resource users that share the rights and duties of a resource. Such arrangements are especially directed to maintain the continuity of use of and to justify a fair access to the resources.

Unlike open access resources, common property management has a defined user group with regulated access. They also have locally-constituted usage rules, which are monitored and enforced within the framework of community norms. Common property management is by nature a sustainable, self-governing institution, which reflects community values. Rules for monitoring and enforcing access and use of common property management are developed over a long period of time. These rules are developed in formal and informal forums, which are open to all common property resource owners.

The performance of self-governed common-pool resource institutions varies across systems and time. Some self-governed resources have survived and have been successful in managing natural resources, while others have faltered or failed. In addition to the consensus regarding the theoretical variables conducive to self-organization, considerable agreement also exists about the characteristic of those self-governing systems. Such systems are robust in the sense which, according to Ostrom (1998), they survive for a very long period of time constantly utilizing the same basic rules for adapting to new situations.

The question of *'what works and what does not'* has been the driving force behind many research investigations of Institutional Discourse, especially in defining the set of conditions critical to sustainably managing CPR. Ostrom (1990) generated eight design principles based on lessons from 14 detailed case studies previously generated by other scholars. She claims each design principle is "an essential element or condition that helps to account for the success of these institutions in sustaining the CPR and gaining the compliance of generation after generation of appropriators to the rules in use" (Ostrom, 1990, p.90). Table 3.3 presents the eight design principles required for long-enduring common-pool resource institutions.

This study by Ostrom (1990) is among the three important studies cited by Agrawal (2001) to provide an overarching synthesis of factors affecting successful management of the commons. The other two studies are Wade (1988), and Baland and

Platteau (1996). Agrawal (2001) believed they represent three of the most-significant analyses of local community-based efforts to manage and govern common-pool resources. Wade (1988) studied the commonly-managed irrigation systems of 31 villages in South India and examined why do the commons institutions arose in these villages and what accounted for their success in resolving commons dilemmas.

Table 3.3 Institutional features required for long-enduring common-pool resource institutions (Ostrom, 1990).

No.	Principle	Description
1.	Clearly defined boundaries	Individual or households with rights to withdraw resource units from the common-pool resource and the boundaries of the common pool resource itself are clearly defined.
2.	Congruence	a. The distribution of benefits from appropriation rules is roughly proportionate to the costs imposed by provision rules. b. Appropriation rules restricting time, place, technology and/or quantity of resource units are related to local conditions.
3.	Collective-choice arrangements	Most individuals affected by operational rules can participate in modifying operational rules.
4.	Monitoring	Monitors, who actively audit common-pool resource conditions and user behaviour, are accountable to the users and/or are the users themselves.
5.	Graduated sanctions	Users who violate operational rules are likely to receive graduated sanctions (depending on the seriousness and context of the offence) from other users, from officials accountable to these users, or from both.
6.	Conflict-resolution mechanisms	Users and their officials have rapid access to low-cost, local arenas to resolve conflict among users or between users and officials.
7.	Minimal recognition of rights to organise	The right of users to devise their own institutions are not challenged by external governmental authorities.
For common-pool resources that are part of a larger systems		
8.	Nested enterprise	Appropriation, provision, monitoring, enforcement, conflict resolution and governance activities are organised in multiple layers of nested enterprises.

Baland and Platteau (1996) draw on a wide-ranging review of economic literature on property rights and empirical studies of CPR management. They argue

that the privatisation of CPR or their appropriation and regulation by central authorities is likely to impair the efficiency of resource use and, even more likely, to disadvantage traditional users whose rights of use are seldom recognised under privatisation or state governance. They found that existing research suggested a number of variables which are crucial to the success of community-level institutions: the size of the user group, the spatial distance of users to the resource, the homogeneity of group members, effective enforcement mechanisms and past experiences of cooperation were among the significant factors they highlight for ensuring commitment and achieving cooperation.

Based on these and other studies, Agrawal (2001) synthesised the factors affecting successful management of the commons and grouped them into four sets of variables: 1) characteristics of the resources, 2) the nature of the groups that depend on the resources, 3) the particulars of the institutional regimes through which resources are managed, and 4) external forces and authorities. Table 3.4 presents this synthesis in brief.

Table 3.4 Agrawal's synthesis of enabling conditions for sustainable management of CPR (from Agrawal, 2001 as adapted from various previous reports, including Wade, 1988; Ostrom, 1990; and Baland and Platteau, 1996).

Variables	Factors
1. Resource system characteristics	▪ The resource system size is relatively small. The larger the extent of the CPR' boundaries, the more complexity will be added, reducing chances of success. ▪ The resource system's boundary is well defined so that membership is clear, and allocations and regulations can be effectively applied. ▪ The resource's mobility level is low. ▪ Benefit from the resource can be stored. ▪ The resource's stock is predictable.
2. Resource user characteristics	▪ The stakeholder group size is relatively small: the smaller the number of users the better the chances of success. ▪ The group of stakeholders is clearly defined. The more clearly-defined boundaries of the groups, the better the chances of success. ▪ There are shared norms. ▪ There are past successful experiences in community organisations. ▪ There is appropriate young leadership familiar with changing external environments, connected to local

	traditional elites. ▪ There is interdependence among stakeholder group members. ▪ Heterogeneity of endowments, but homogeneity of identities and interests. ▪ Levels of poverty are low.
(1 and 2) Relationship between resource system characteristics and resource user characteristics	▪ There is an overlap between resource-user residential location and the resource location. The greater the overlap between the location of the CPR and the residence of the users, the greater the chances of success ▪ There is a high level of dependence on local resources: the greater the demands (dependencies) and the more vital the resource for survival, the greater the chance of success. ▪ There is fairness in the allocation of benefits from commons resources. ▪ There is sufficient knowledge of sustainable yields: the better the knowledge of sustainable yields the greater the chances of success. ▪ Any changes in levels of demand are gradual.
3. Institutional and organisational arrangements.	▪ Rules are simple and easy to understand. ▪ Access and management rules are locally devised. ▪ Enforcement of rules is easy. ▪ Graduated sanctions are implemented. ▪ Availability of low-cost adjudication. ▪ Monitors of resource users are accountable. ▪ Restrictions on harvest are matched to the regeneration of resources.
4. External Environment	▪ Technology: o Low cost exclusion technology. The lower the cost for exclusion (such as fencing), the better chances of success. ▪ Market: o There is low articulation with the external market. o Change in articulation with external markets is gradual. ▪ State o Central government strengthens local authority. o There are supportive external sanctioning institutions. o There are appropriate levels of external aid to compensate local users for conservation activities. o There are nested levels of appropriation, provision, enforcement, and governance.

Tables 3.3 and 3.4 together provide a concise summary of the insights and lessons learned that have emerged from the many uncoordinated yet rapidly-growing efforts of locals to manage their commons resources. Far too often, local initiatives have been observed to fail in the face of top-down government-initiated centralised management. This occurs where centralized management of public property resources disregards years of local management knowledge, and can result in new and costly or ineffective monitoring regimes that use little of the existing resource knowledge. Central government management methods have often involved the implementation of unilateral sanctions which can alienate local users at the same time as increasing monitoring and enforcement costs (Arrow, 1974; Dutton 2004). Common property management has the potential to assist local users in self governance, in developing rules for the access and use of local natural resources, whether they are common property or publicly owned resources. As the cost and role of governance continues to come under scrutiny, the role of common property management regimes may become increasingly valuable in providing sustainable use of natural resources for a nominal public investment. Ultimately, the success of a common property management regime rests in the hands of the local community that gains their livelihood from those resources.

Up to this point, I have discussed the types of property rights associated with managing common-pool resources and the complexity of designing and establishing an appropriate institution needed to form the basis for a dynamic interaction between the local community and the resources on their vicinity. Such institutions are essential in generating a sustainable community livelihood. Returning to the question at the earlier part of this chapter (page 52), the driving factors behind the success or failures of local initiatives can be described through the lens of an effective institutional arrangement. The above discussion has presented the essential components that regulate the common-pool resources and, to some extent, provide indications of sustainable institutions. Ostrom (2005) argues that an institutional analysis framework needs to provide assessment and explanation of the dynamic inter-relationships among contextual variables, incentives for stakeholders to co-operate, patterns of interaction amongst stakeholders, and the ensuing outcomes of a resource management initiative.

Whereas open access regimes have been noted to have little to no strength in addressing natural resource degradation and overuse (Table 3.1), other types of regime have often been prescribed as a single solution to common-pool resource problems.

Hanna *et al* . (1996) conclude that single solutions may have both effective and ineffective controls over the various factors which lead to resource degradation. Nonetheless, many scholars indicate that common property regimes are more effective in overcoming resource degradation problems if the circumstances in Table 3.4 apply (Agrawal, 2001; Ostrom, 1990; Baland and Platteau, 1996). To deal with the inherent limitations of applying state, private or common property right regimes, a growing number of scholars have recommended co-management approaches which combine aspects of two or more management regimes (Jentoft, 1989; Berkes, 1994; Nikijuluw, 2002). This approach is considered a better way of combining the strengths of different stakeholders and improving the level of built-in controls needed for effective management (Pomeroy and Berkes, 1997). The next section of this chapter looks into the implications of co-management and the opportunities and challenges this management regime brings in the face of growing recognition of bottom-approaches and calls to link them with top-down approaches.

3.3. A CRITICAL ASSESSMENT OF COLLABORATIVE APPROACHES TO RESOURCE MANAGEMENT

The question of how to manage coastal resources effectively has long been a concern amongst scholars, researchers and practitioners, with many alternative approaches being discussed (Johannes, 1978; Jentoft, 1989; Hanna *et al*., 1996; Christie *et al*., 2005). One approach that has captured significant attention and created its own discourse is collaborative co-management. This is a resource management approach designed to manage activities in coastal areas in close cooperation with local coastal communities. This approach is based on the recognition that human activities are an inherent part of all ecosystem functions, and that coastal issues such as resource use conflicts, habitat degradation and resource over-exploitation are all a function of how local people view and value their resource base. This approach is based on the assumption that it is impossible to understand the environment and manage coastal and marine resources without paying attention to the communities of resource users who live and work in the coastal area. Local people are core participants of social community life and economy and, thus, they are stakeholders with interests in the sustainability of local resources.

Coastal communities inevitably rely on coastal and marine resources for their livelihood and survival. Studying both the livelihood activities of the coastal community, and the ways in which communities use resources and make decisions about their use, is essential for sustainable management of coastal resources. The collaborative approach to resource management mentioned above offers a new paradigm for assessing the arrangement of responsibility, authority and control over resources. According to this paradigm there is a need for an improved quality of community participation in coastal resource decision-making. This way of thinking is a response to the bleak pictures of experiences of government-controlled management of fisheries (Jentoft and McCay, 1995; Ferrer *et al*., 1996), forestry (Berkes, 1996; Burkey, 1993) and other resources (Hainsworth and Poerbo, 1997; Bryant and Wilson, 1998). As shown above, past experience is that many regulations, when implemented by government without consulting or involving communities, eventually meet with only-limited success at best, or jeopardize the local-community livelihood at worst.

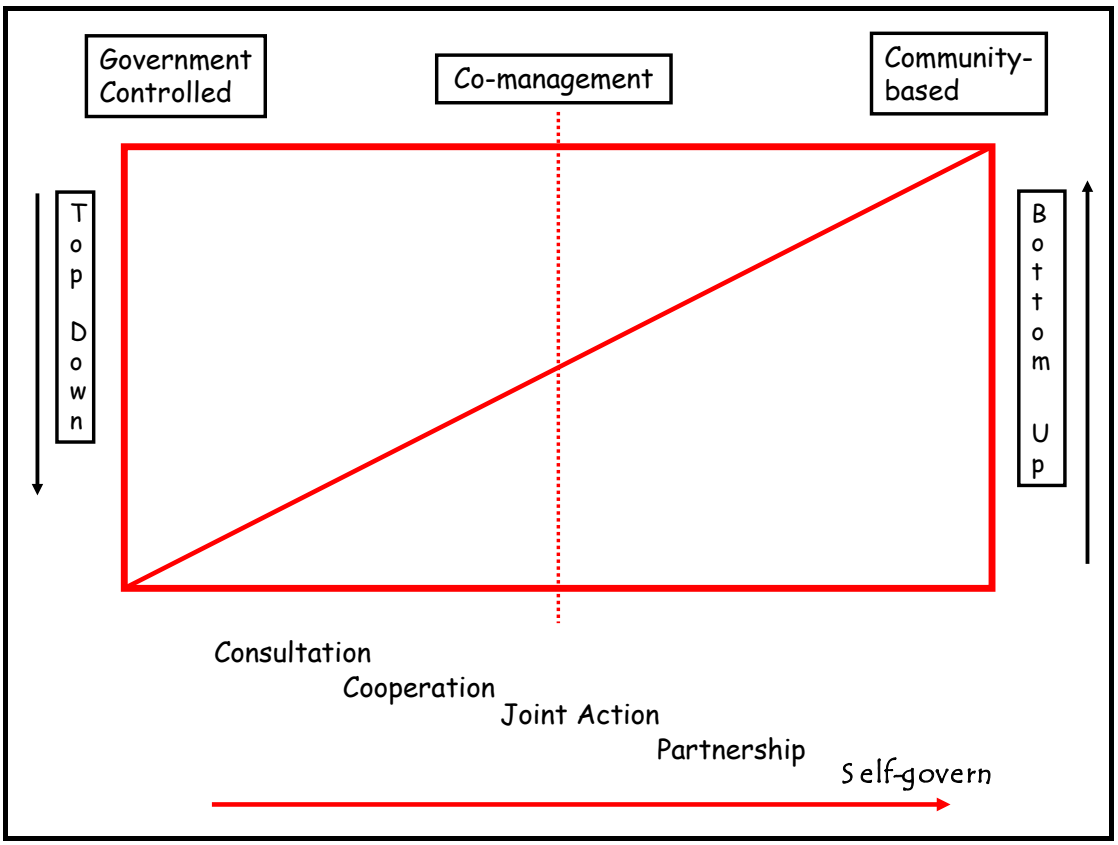

Figure 3.4. From state-based to community-based management (adapted from Berkes, 1994).

Collaborative approaches to resource management, better known as 'co-management', are systems in which both government and community organisations have specific management responsibilities and authority, and ultimate control of the overall process does not rest with any one group. It is essentially an interactive power-sharing process between the government and local community to manage the utilization of natural resources or a particular resource that both parties have agreed to manage together. Co-management is a term describing various partnership arrangements and degrees of power-sharing and integration of local- and government-level management systems. How these powers and responsibilities should be shared between community and government or other outside interests is at the heart of debates about co-management. As suggested by Figure 3.3, which is based on Berkes (1994), the degree of power-sharing is perceived as a continuum. One end represents a fully-centralized government-controlled management system, whereas the opposite end represents community self-governance. Between these two opposite ends lies the spectrum of co-management, ranging from combinations of weak-community and strong-government influences to those of strong-community and weak-government influences.

Co-management is often presented as being in opposition to community-based management (McCay and Jentoft, 1996), or may also be viewed as a subtle co-option of the community agenda by government agents (Kearney, 1989). In reality however, the two do not necessarily conflict because local community-based management systems usually require outside support to complement and extend community efforts. Pomeroy and Williams (1994) observe that community-based management is a central element of co-management. Berkes *et al.* (1991, p.13) define co-management as "the active participation in management of a resource by the community of all individuals and groups having some connection with, or interest in, that resource", whereas Fellizar (1993, p.2) provides a definition of community-based management as "a process by which people themselves are provided the opportunity and responsibility to manage their resources, define their needs, goals and aspirations and make decisions affecting their well-being".

Putting these two definitions side-by-side, it appears that there is a much greater potential for successful resource management when there is room for working together among different parties. It can be argued that management of coastal resources, for example, should always require cooperative (co)management because

coastal systems cannot be readily isolated from larger natural and political systems (Rivera and Newkirk, 1997). For community-based management proponents, however, co-management should imply a power-sharing arrangement whereby the priorities of coastal communities drive the management process. Such an approach is occasionally called community-based co-management (Pomeroy, 1997).

Although many communities in Indonesia have retained their traditional management system of harvesting and distributing local natural resources, the state effectively claimed all natural resources nation-wide through the constitution drafted soon after the 17 August 1945 independence proclamation. As mentioned previously in Section 3.2, and with more elaboration in Section 1.3.3, despite sporadic implementation in many parts of Indonesia, traditional resource management regimes were not legally recognised until 2004. Community-based co-management of coastal resources is an innovative approach to resource management that requires the devolution of certain responsibilities from the state to the community. Local participation and the empowerment of coastal communities are important aspects of this approach. It involves some degree of communal management of the resource and, in many instances it may involve recognition and legitimization of traditional local-level management systems.

To some, especially those involved with coastal communities in the Southeast Asian region, the discourse about this approach is more familiarly known as CBCRM, an acronym for Community-Based Coastal Resource Management (e.g. in Ferrer *et al.*, 1996; Rivera and Newkirk, 1997; Dutton, 2004; Christie et al., 2005). It is often argued that, ideally, CBCRM should evolve from a situation of heavy government intervention towards growing community responsibly. As Figure 3.2 exemplifies, it may gradually advance from consultation and, as community empowerment continues, to cooperation followed by joint action and then partnership. Eventually, the community, when capable of self-determination, will self-govern and self-manage its own resources.

Most conventional resource management approaches focus exclusively on the conservation of the resource stock. CBCRM, being a derivative of co-management, is unique because it focuses on the resource-user relationship instead of on the resource *per se*. Ferrer (1992, p. 25) asserts that the function of CBCRM is to “work towards greater economic and social equity, better access to service for all, greater participation in decision-making and deeper involvement in the organization process

for the empowerment of people". It shows that CBCRM considers the importance of the three major components of sustainability (ecosystem, economic, and social sustainability) specified in the previous chapter.

The previous chapter also highlighted the role of the Integrated Coastal Management (ICM) regime as the most common approach prescribed by government in Indonesia. It has been implemented or exercised widely by many organisations in Indonesia with either full- or part-funded government support. As discussed, however, ICM is a top-down mode of management, with more attention being paid to addressing symptoms rather than working from below to mobilise local capacity to deal with resource management problems. Although ICM proponents argue that the relationship between coastal communities and their surrounding environment is one of the core aspects of ICM, it is hardly the case in implementation. This situation opens up a niche for CBCRM to play an important role. Within the wider perspective of ICM, both CBCRM and ICM recognise the importance of not only the coastal resources but also stakeholder dynamics, especially in efforts to promote sustainable livelihoods. Since an ICM program is concerned with integrating the many aspects of coastal area development, CBCRM can add to the holistic overview of such program. Indeed, Hildebrand (1997) observed that it is at the local level that much of the innovation and real action in ICM takes place.

3.4. CHALLENGES TO IMPLEMENTING COMMUNITY-BASED RESOURCE MANAGEMENT IN THE INDONESIAN CONTEXT

In analyzing the social and economic realities of coastal communities, it is desirable to start from their patterns of resource utilization and concepts of management. There are more than 7000 coastal villages in Indonesia, most of which rely on inshore fishing. The villages are characterised by poverty, underdevelopment and low levels of formal education. An array of laws and regulations, indirectly or specifically, affect marine resource management and are intended to serve as normative bases for ocean and coastal governance regimes. The fact that coastal communities, specifically fishing villages, have been left behind in the development process driven by these institutions reveals that there is a discrepancy between their normative and practical outcomes. One of the root causes of this problem can be

traced to the ineffective institutional arrangements available to manage the complex task of sorting out overlapping authorities. It has been suggested that one viable option for addressing the challenges of marine resource management in Indonesia is to create a national cross-sectoral coordinating agency, which would develop local management capabilities and foster community participation (Dahuri, 2003).

The idea of reinventing governance to create accountable and more-effective policies in Indonesia drove the implementation of the Local Autonomy (popularly known in Indonesia with its acronym *OTODA*) or Decentralisation Policy in 2001, as a further response to the *Reformasi Era* which started in 1998 (see Chapter 1, Section 1.3.3 for further details on this). This decentralisation policy reflects the intention to further pursue governance reform and devolution of authority. Its implementation has particular consequences for environmental management regimes, including marine resource management. Devolution of authority from the central government to local government at *kabupaten* and *kota* (districts and cities) level was formulated through National Acts No. 22 and 25 of 1999, which include the decentralization of Indonesian seascape management. These Acts later evolved, with necessary adjustments, into Acts No. 32 and 33 of 2004. Nonetheless, the implementation of these acts has been an ambiguous 'tug of war' in practice, often presenting problematic choices for regencies. For example, in terms of marine resource management, conflict among fishermen fighting for fishing territory has started to emerge as an example of the potentially-negative impacts of the *OTODA* policy. On the other hand, it has become clear that the old centralized mode of managing Indonesian seascape territory and its embodied resources is already obsolete and unable to respond to the increasingly complex challenges of community needs in a democratic atmosphere.

Looking back to the old regime of centralized marine resource management, Indonesia is now faced with two ironic facts: poor coastal communities in the midst of potentially rich marine resources; and a continuously degraded environment in the midst of communities believed to have traditional ecological wisdom. Such paradoxes call for greater attention to be paid to the possibilities of allowing communities to play a significant role in managing the resources on which their lives depend.

A community is basically 'sustainable' when it is able to survive and at the same time use its environmental resources in an ongoing manner. In other words, the community is capable of using its local resources in ways that allow them to be self-

sustaining. Coastal communities in Indonesia, in general, have strong physical and cultural bonds to their environment and rely heavily for their livelihoods on resources from the surrounding sea. Today however, many of these livelihoods are being degraded by the modern way of life and urban consumerism, despite the fact that these communities are also trying to maintain the traditional knowledge system and ecological heritage established centuries ago by their ancestors in order to stay in touch with their environment. This example shows that traditional knowledge and practices, whilst informing people about how ecosystems have, and can work, is not always enough in the face of the pressures of modern society and populations.

Traditional ecological knowledge and wisdom existing within the coastal communities in the Sulawesi region may be seen as a crystallized record of the experiences of their forefathers interacting with nature over a long period of time. The way people utilize coral reefs and mangroves is very much determined by the level of their understanding and perception of the cultural, socio-economic and ecological values of the resources. Therefore, a good understanding of the community's perception of the coastal resources will be essential for those intending to produce an effective approach to coastal resource management, especially when considering collaborative approaches which put emphasis of empowering the community through bottom-up process.

To be effective, a management regime for coastal resources needs much more than just regulations from authorities (local, regional, or national), especially when the situation dictates regulations that are hard to implement or when nature throws impediments in the way of law enforcement. Examples of such situations can be seen in the management of Marine Protected Areas (MPA). The World Resource Institute reported that only 3 out of 113 MPA in Indonesia are working effectively (Burke et al., 2002). Observations from the field show, for example, that the Takabonerate Marine Park faces huge problems because of remoteness and limited accessibility. Therefore, a coastal resource management programme should be able to address the need for balancing development efforts against the maintenance of a region's ecological integrity as well as the local community social-economic landscape. Planning for such management requires a systematic understanding of the dynamic interactions that affect different activities and resources in the area and analysis of how these interactions are likely to develop over time.

The challenge in formulating a proper planning is basically to design an institutional structure that is as integrated as the coastal ecosystems itself. Certainly, there is no simple answer to such a complicated challenge. Since the formulation of such institutional structures is nearly impossible, the key strategy should then be: (1) to foster proper use and care of resources by local communities, (2) to empower local communities through community-based co-management, and (3) to strengthen coastal economies and deal effectively with poverty.

3.5. CONCLUSIONS

The general typology of symptoms of coastal resource problems is primarily occurring due to conflicts in spatial use-patterns and natural resource yield-allocation. Beyond these symptoms, however, lies a fundamental problem of human intricacies in negotiating power and access to resources, on which community livelihoods depend. To be effective, therefore, any attempt to address resource problems in coastal areas must consider a shift in paradigm from managing natural resources *per se* to managing the relationship between people and resources. With a few exceptions, centralized management regimes alone do not work effectively for coastal communities and their resources. On the other hand, there are compelling examples of community-based resource management that have worked in the past.

Although there have been some failures, mainly due to process, and there have been many obstacles to development of CBCRM, there are enough compelling reasons and information sources available on the benefits of CBCRM to warrant its serious consideration in Indonesian coastal areas. The main goal should be to improve the living conditions of all individuals by developing Indonesia's land and water resources in ways that are economically viable, socially equitable and environmentally sustainable.

In attaining this goal, the following goals should be considered:

- **Ecological viability:** the physical and biological processes that maintain the productivity of natural ecosystems must always be kept intact.

- **Social equity:** the people themselves should be fully committed to supporting sustainable development activities. This could be realized by fostering equity in access to resources and benefits derived from them, and through participative processes.
- **Economic efficiency:** in the face of scarcity, economic capital and resources should be carefully managed and monitored, and utilized to improve the quality of people's lives. Economic efficiency means that human welfare is maximized within the constraints of existing natural-capital stocks and technologies.
- **The integrated approach:** this approach leads to a holistic view of problems and issues prevailing in the environment, as well as opportunities for cooperation and sharing, that will eventually provide the resources, coordination and political will to implement and sustain programme activities.

In conclusion, I would like to quote a useful reminder of the importance of capacity building in understanding the dynamic relationship between coastal communities and their adjacent resources. Confucius (551-479 BC), an ancient Chinese philosopher once said:

Give a man a fish and he will eat for a day.
Teach a man to fish and he will eat for a lifetime.

An old wise man I met in Bau-bau, Southeast Sulawesi, during my October 2005 fieldwork suggested that an 'improved' version of this proverb would be:

Give a man a fish and he will eat for a day.
Teach a man to fish and he will eat until the resource is depleted.
Teach a community to manage its fishery resources and it will prosper for generations to come.

CHAPTER IV. METHODOLOGICAL FRAMEWORK

4.1. INTRODUCTION

This last chapter in Part One introduces the approaches and analytical framework used to gather and examine the research data for this thesis, by describing the two case studies performed in the field and the process of data acquisition in each case study. It describes the relevant attributes of the research sites to explain their selection and defines the data scope and quality. It then establishes the analytical framework through which this thesis will examine and analyse the resource problems occurring at each site, in order to provide the basis for a synthesis of the study findings.

4.2. THE STUDY AREA

The first and major fieldwork campaign was conducted for six months (7 September 2005 until 7 March 2006) in Indonesia as the basis for data acquisition for this research. The fieldwork was concentrated in the region of Sulawesi Island, one of the five major islands that make up Indonesia. Eleven study sites were chosen, labelled as sites 1 to 11 in Figure 4.1. Each of the sites has its own specific character and pattern of utilisation of coastal resources. Table 4.1 presents a summary of the role played by each site in the case study, their local names, and location in relation to the seven districts and three provinces examined in Sulawesi Island.

A second, shorter fieldtrip was conducted in January 2007, during which the field sites were revisited for updates on the conditions of the coastal resources, communities and their institutions.

Sulawesi Island is the world's eleventh largest island, covering an area of approximately 174,600 km^2, with a total coastline of 7500 km (GoI, 2007). It is located in the centre of Indonesia and has a distinctive K-like outline. The island's size is roughly comparable to the North Island of New Zealand, but has a population which stood at 14.5 million in 2004. The island is subdivided into six Provinces: the Gorontalo, and the South, Southeast, West, North, and Central Sulawesi. It is the

region where Alfred Russel Wallace (1823-1913) drew the Wallace line, a line that cuts across two great zoogeographic regions, the Oriental and Australian, which give the local ecosystems a specific character (Wallace, 1869). Asian and Australian elements are co-mingled in the fauna of Sulawesi, resulting in the great diversity of marine fauna which make the region a popular tourist diving destination.

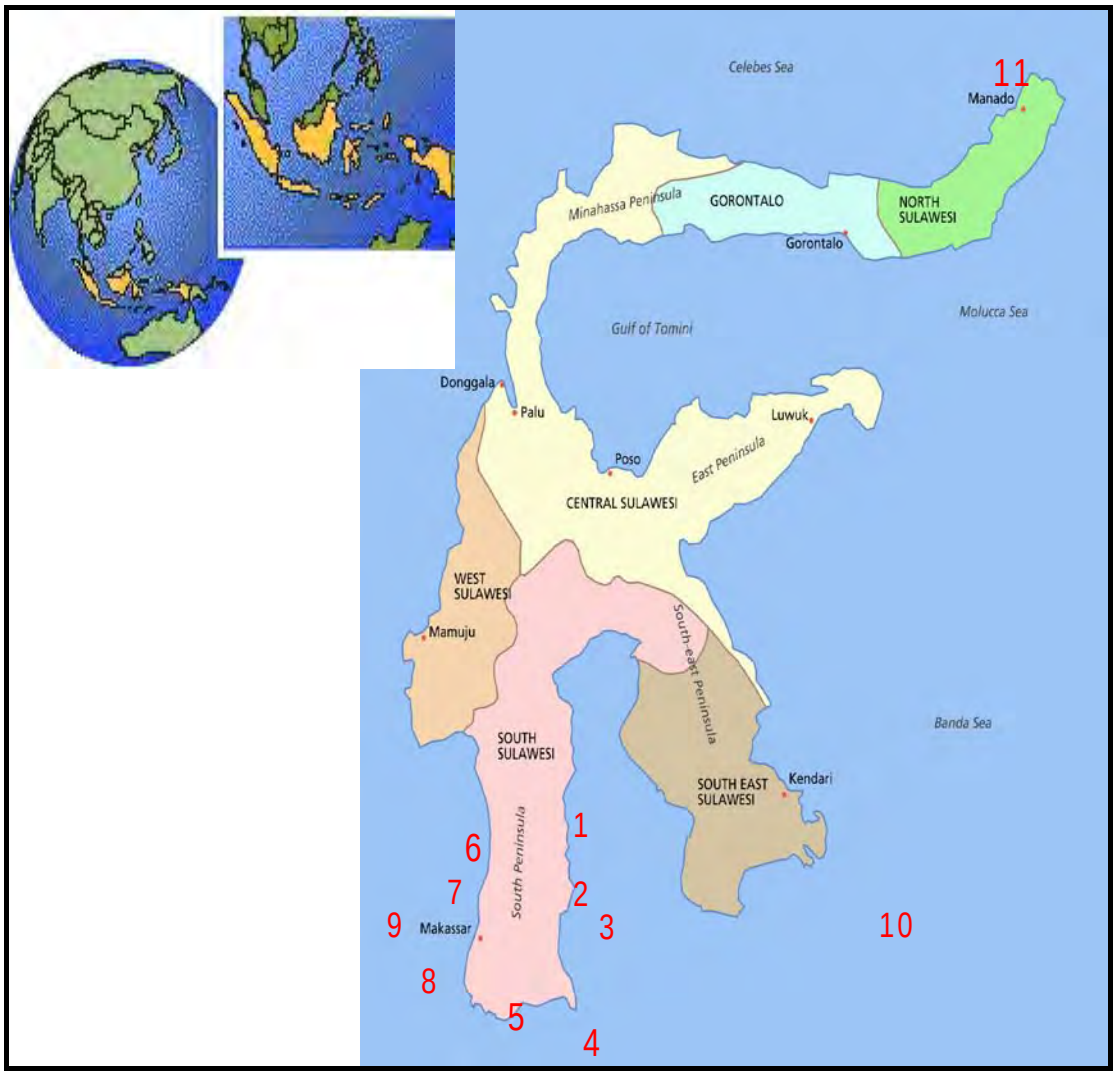

Figure 4.1 Location of the Indonesian field work sites, concentrated in the Sulawesi region and defined on the map as Sites 1 to 11. (Map is courtesy of CCRR-Unhas).

In addition to the above rationale, Sulawesi Island was chosen as the focus of this research for the following reasons:

a) It has been reported as being a part of the ‘coral triangle’, an area to the south of the Philippines around the equator stretching to the east as far as the island

of Papua, where the world's most diverse coral reefs are found (Hopley and Soeharsono, 2000; and Bechtel *et al.*, 2004). In addition to this, the flora and fauna of Sulawesi are uniquely diverse, with many species identified as being endemic (Whitten et al., 1984). Along the coastal areas three ecosystems dominate: coral reefs, seagrass and mangroves (Bengen, 2001).

b) This is the most industrialised area of eastern Indonesia; hence it has very great resource management challenges. This area has reportedly one of the highest frequencies of destructive fishing incidents in Indonesia according to a DFW Report (2003), and massive mangrove conversion has also taken place (Nurkin, 1994).

c) Sulawesi has one of the highest population burdens outside Java. Indonesia does not have a good distribution of population: most people reside in Java, which has a density of 980 people/km^2, while the national figure is 126 people/km^2 due to the sparse population of eastern parts such as in Maluku and Papua. Sulawesi has a population density of 92 people/km^2 (GoI, 2007) but densities are much higher in its coastal regions compared to the central highlands.

d) My own familiarity with the communities of Sulawesi and their characteristics enhanced the process of understanding the institutional arrangements related to the coastal environment of the region.

Activities utilising the two major coastal resources occurring in the research sites, the mangroves and coral reefs, were examined. The mangrove case study is an in-depth analysis of mangrove conversion and conservation in South Sulawesi. It was conducted by contrasting two cases: locally-initiated mangrove rehabilitation in Tongke-tongke (Site 1) on the one hand, and mangrove conversion into intensive shrimp ponds by a large company in Lamurukung (Site 2) on the other hand. The coral reef case study was primarily an exploration of the interaction between coral reefs and coastal communities, with special attention given to the role that coral reefs play in local fisheries. The coral case study was conducted at nine sites, from Site 3 to Site 11. Table 4.1 presents the role of each of the 11 sites included in this research.

The 11 study sites were chosen based on the following considerations including: the availability of cases to review, site accessibility, contact with resource

people on site and logistical requirements. The following is a short profile of each study site.

Table 4.1 Management and administrative characteristics of the eleven study sites used in the mangrove and coral reef case studies.

CASE STUDY	SITE REFEREN-CE USED IN THIS THESIS	SITE'S ROLE IN THE CASE STUDY	LOCAL NAME	ADMINISTRATIVE AREAS	
				DISTRICT	PROVINCE
Mangroves	Site 1	Large scale conversion of mangroves into shrimp farm industry	Lamurukung	Bone	South Sulawesi
	Site 2	Community-based mangrove forest conservation	Tongke-tongke	Sinjai	
Coral Reefs	Site 3	Relatively unmanaged coral reefs areas	Pulau Sembilan		
	Site 4	Central-government appointed MPA	Taka Bonerate MPA	Selayar	
	Site 5	Relatively unmanaged coral reefs areas	Tambolongan		
	Site 6	Locally initiated MPA	Mattirobombang	Pangkep	
	Site 7	Locally initiated MPA	Barrang Caddi Island	Makassar	
	Site 8	Locally initiated MPA	Bone Tambung Island		
	Site 9	Relatively unmanaged coral reefs areas	Outer Coasts of Makassar		
	Site 10	Central-government appointed MPA	Wakatobi MPA	Wakatobi	Southeast Sulawesi
	Site 11	Central-government appointed MPA	Bunaken MPA	Manado	North Sulawesi

Site 1: Lamurukung Village, District of Bone, Province of South Sulawesi

The Bone District is located 200 km northeast of Makassar city, the capital of South Sulawesi Province. The size of Bone District is 4559 km^2, with a population of 656,000. The average population density in this district is 140/km^2. The Lamurukung Village itself is only 20 km^2, with a population of 4500 according to the Village Statistic in 2000.

Lamurukung Village was chosen as a study site for the existence of a private company (PT.SAU) that has a concession to operate 545 ha of intensive shrimp farming. The company cleared a considerable part of the village's mangrove area to convert it into intensive shrimp ponds in 1989. The company started to produce shrimp in 1990, achieved peak production in 1994, with the ponds going downhill from then on, ceasing to produce in 2000. The site reveals an interesting case of large-

scale conversion of mangrove for cash-crop products to earn foreign currency at great cost to the local environment.

Sites 2 and 3: Sinjai District of South Sulawesi Province

The Sinjai District is located around 200 km south east of Makassar. The size of this district covers an area of 820 km^2. The population of the district in 2005 was 250,780. In addition to the mainland, Sinjai also has a group of nine islands called the Sembilan Islands. It has a 37 km coastline along the shore of mainland Sulawesi, excluding the coastline of the nine small islands within Sinjai jurisdiction in Bone Bay. Two sites were chosen in Sinjai, namely: Tongke-tongke Village (site 2), an area where a mangrove rehabilitation efforts by the local community have been recognised as having successfully brought the village back from the brink of being washed into the sea due to coastal erosion; and Sembilan Islands (site 3), a group of islands with considerable coral reefs which have not been managed successfully, falling victim to extensive destructive fishing activities. Together these sites provide an interesting juxtaposition of locally-initiated mangrove rehabilitation that received national recognition alongside simultaneous major coral reef deterioration.

Sites 4 and 5: Selayar District of South Sulawesi Province

The Selayar District is located 250 km to the south of Makassar. The land area of this district is approximately 903 km^2. The sea area, however, is much bigger at 32,200 km^2. The population of the district in 2000 was 178,163. Selayar has proclaimed itself as a Maritime Regency, putting more emphasis on its marine wealth for development purposes. Two sites were designated in Selayar for this study, namely: the Taka Bonerate National Park (site 4) appointed by central government; and the Tambolongan and Polassi islands (site 5), inhibited by two communities with different attitudes toward marine conservation efforts. These areas provide an interesting comparison between managed and unmanaged marine areas within one district area.

Site 6: Pangkep District of South Sulawesi Province

The Pangkep (Pangkajene Kepulauan) District is located 50 km to the north of Makassar. This district covers an area of 62,147 km^2, but the land region is less than 2% of this. The population of the district in 2000 was 269,164, unevenly spread over its mainland and islands. 81% of the population lives on the mainland, with a density of 282 people per km^2. The remaining 19% resides on the islands with a density of less than 143 people per km^2. The archipelago consists of 117 islands, of which 76 are inhabited, spread over a range of 396 km from west to east. The closest island to Pangkajene, the capital of Pangkep District, is just 6 km away, while the farthest island is 414 km away. The majority of the people (70%) work in agriculture and the primary product sector, including fisheries. In terms of socio-economic well-being, the island communities are lagging behind the mainland people.

The village of Mattirobombang (site 6), located five miles from the mainland, was chosen as an example of a Marine Protected Area (MPA) set up collaboratively between academia and the local community.

Sites 7, 8 and 9: Makassar City, South Sulawesi Province

Makassar city is the capital of South Sulawesi Province. The city area covers 176 km^2 with a population of 1.28 million people. In addition to the land area in the main Sulawesi Island, Makassar also has 11 islands within its maritime jurisdiction. It is the largest city in the eastern part of Indonesia and faces problems common to other big cities such as rapid urbanization, increasing pollution, and limited space and facilities.

Two Makassar sites were also chosen to examine local MPAs set up in collaboration between academia and the local community. Barrang Caddi Island (site 7) is located three miles seaward of the city's shoreline, whereas Bonetambung Island (site 8) is ten miles from Makassar's shoreline. At the sites local MPAs were set up with help mainly from Makassar's hometown university, the Hasanuddin University. The results of establishing the MPAs in these two locations have been quite different and offer interesting lessons. Beyond these two sites is a much wider area of open sea (site 9) which is part of Makassar City's jurisdiction but with little or no particular management regime except a territorial claim from the municipality. Collectively, these three sites offer different experiences and perspectives in managing coral reef

resources through the variety of dynamics between, and backgrounds of, the communities and stakeholders involved.

Site 10: Wakatobi District of Southeast Sulawesi Province

The Wakatobi National Park is the second largest national park in Indonesia and covers an area of 1.39 million hectares, consisting of four main islands that lie in a south-easterly direction. The largest of the islands, Wangi-wangi, lies at the northern most edge, followed by Kaledupa, then Tomia, and Binongko. The first two letters of each island makes up the name Wakatobi. According to 2001 statistics, the total population of this area is 87,953, consisting of 21,000 households.

Site 11: Bunaken Village, Manado City of North Sulawesi Province.

There are three National Parks in the Sulawesi region: the Taka Bonerate in Selayar, the Wakatobi in the district of Wakatobi, and the Bunaken National Park in Manado City of North Sulawesi. Bunaken is considerably smaller than the other two. The size of the island village is 89,056 ha with a population of 30,000 people. Bunaken has become increasingly popular in the last few years as a tourism diving destination.

4.3. DATA SCOPE AND QUALITY

The purpose of data collection is to provide the materials for understanding the context and issues relevant to the research questions, and to develop and refine the theory. The process of data acquisition on the field referred to the guidelines provided by Bunce *et al*. (2000) and Neuman (1994). A combination of field observations, focus group discussions, questionnaires and in-depth interviews were conducted on site to generate the primary data needed, while secondary data was obtained from many relevant institutions. Interviews were conducted with the local community (such as fisherfolk, labourers, and merchants); government officials (from local, provincial and national levels); researchers and scientists from various backgrounds in the universities and research institutes; local NGOs; and other parties with a stake or interest in coastal and marine resources.

Before going further into the details of the data analysis it is important to ensure that the data collected are appropriate so that the data acquisition process has validity. There are four important aspects to consider for this process, namely: positionality of the researcher, the research strategy, sampling techniques, and data collection procedures. These four aspects were part of the research design process prior to conducting the fieldwork. The following is a discussion of these aspects which describes: the researcher's positionality, triangulation as a research strategy, sampling techniques, and quantitative and qualitative data collection procedures.

4.3.1. Positionality

As a researcher, it is important for me to aim to collect "robust" data. When considering my background, my detachment (or in some settings, rather more of attachment) to the communities I studied, aiming for that data to also be somewhat "objective" is a problematic concept. As England (1994) indicated, social scientists are increasingly suspicious of the possibility of "objectivity" and value-free research, and therefore are gradually accepting the notion of the socially constructed and situated nature of knowledge. England (1994) was specifically problematizing the fieldwork aspect of research where the researcher directly confronts those who are researched. In addressing the problem, Rose (1997) suggests we consider positionality and reflexivity in conducting the research, especially in the process of obtaining qualitative data. The term positionality refers to the awareness of the researcher to his/her own background and how the people being researched may perceive him/her, whereas reflexivity refers to the process of thinking through the power relations between the researcher and the researched person(s) and how these may influence the data interpretation and knowledge production (Sultana, 2007).

Despite the possible biases and deceptions that may occur through the nature of power relations between the researcher and the respondent, my research design dictates the need for collecting data through qualitative methods. As Jackson (1985, p157) points out, qualitative methods offer the opportunity "to convey the inner life and texture of the diverse social enclaves and personal circumstances of societies". What is needed is an awareness of the above potential problematization (Chambers, 1997). Thus, I had to be conscious of the possible biases that might come out in my questions and in

respondents' answers. It is important for me as a researcher to be aware of how the respondents of this research, being the source of my primary data, perceive my self.

One of the potential biases in this research is the possibility of the respondents or interviewees to give particular value-laden answers due to their knowledge about my background. Although the level of my familiarity with the eleven study sites is relatively varied from one site to another, I nevertheless command a working knowledge of each site. I know these research sites relatively well, well enough to speak publicly (to conduct FGD) or personally (to conduct an in-depth interview) with relatively no language or cultural barriers.

I am aware of the different hats I have been wearing when I visited these locations in several previous occasions long before conducting this research. For example, I was a mid-level manager of the big shrimp farm company back in 1990 operating in Site 1. On the other hand, I was an environmental consultant when I visited Site 2 in 1996 or in Site 3 back in 2000. Furthermore, I was among a University team that initiated an MPA in Site 6 in 2002. All these experiences have clearly introduced some aspects of my self to these communities. Therefore, when I visited these places back for my fieldwork, during the period of September 2005 to February 2006 and on additional visits to some sites in December 2007, I faced relatively no trouble in communicating with these people. From a different perspective, however, this fact may have pose a potential problem to the "objectivity" of the data collection process (Chambers, 1997; Baxter and Eyles, 1997). There is a question of how the perception of my respondents toward me may have influenced their answers to my questions?

So, how did I address this potential "confounding effect" in my data analysis? To minimize potential deception due to previously developed relations with the respondents, Rose (1997) recommends a kind of reflexivity that aims at a full understanding of the researcher, the researched and the research context. In this case, my awareness of how the respondents perceived my self, my understanding of the dynamics in these communities, and ability to put all the information I gathered into a research perspective, together helped to improve the quality of my data. Furthermore, Jackson (1985) indicated that the inter-subjective nature of social life means that the researcher and the people being researched have shared meanings and therefore should seek methods that develop this advantage. For example, I attempted to achieve a better understanding of how social life is constituted by engaging in constructed

dialogues with people from many different walks of life within the community in order to understand the people by studying in their own terms or, as England (1994, p.243) puts it, “the insiders" view. In addition to this approach, I also took several precautionary measures and practical steps, as described in the following:

- Before starting an FGD or an in-depth interview, I first explained to the respondents what my research was about, its objectives, and how they could help me to achieve those objectives.
- I assured respondents of the confidentiality of their answers and of anonymity status, except when they preferred to be identifiable.
- I informed respondents that the conduct of this research had been approved by the Human Ethics committee of the university where I study.
- Every session of FGD or interview always began with an ice-breaker session, to clear the air and to get the respondents more relaxed before getting into the main subjects of discussion.
- I encouraged the respondents to tell me whatever their opinion was, by convincing them that the research outcome could be part of the solution to improving the state of the resources, which would eventually benefit them.
- At the end of each FGD or interview session, I provided respondents with a summary of the important points that I picked up during the session. I asked for their confirmation of these points or if they wanted to change any of them, or even to withdraw them fully. In this way I tried to make sure that my respondents were not under any pressure to offer their information, especially when it touched on sensitive issues.

4.3.2. Triangulation Strategy

Considering that different methods of data collection and data sources have different strengths and weaknesses, the use of ‘triangulation’ can strengthen the research methods. Patton (1990) describes triangulation as a combination of methods of data collection and data sources in the study of phenomena. The use of several techniques is likely to provide more complete answers to the research questions (Hakim, 1987).

Data triangulation also allows a researcher to address a broader range of attitudinal or behavioural issues amongst stakeholders. This is relevant to this research since, amongst other objectives, it was designed to gather information on how the people from different places put different emphases on resource utilization and how these emphases impact on the perceptions and behaviour of coastal communities in terms of producing variable social and environmental outcomes.

Triangulation of data sources was used as a strategy in this research. Data was collected from multiple sources of evidence, such as: direct observation, focus group discussion, semi-structured in-depth interviews, and questionnaires. Besides primary data, secondary data from various sources were also collected. The many types of secondary data collected included written and recorded materials such as government documents, scholarly writings, project reports, and newspaper articles. These provided further opportunities to explore the values, worldviews, and ideologies behind resource use practices. Most of the agencies contacted helped by providing copies of relevant publications such as policy documents, annual and project reports, and brochures. The references and issues addressed in these documents provided insights into individuals and organisations and, as such, they offer a better understanding of coastal resource management in the field sites.

4.3.3. Sampling Techniques

Three complementary methods of non-probability sampling were used to collect qualitative and quantitative data in each of the two case studies: purposive (also known as judgemental), snowball, and quota sampling techniques.

4.3.3.1. Purposive or judgemental sampling

As noted by Neuman (1994), qualitative research focuses less on a sample's representativeness or on detailed techniques for drawing a probability sample. Instead, the qualitative researcher focuses on how the sample or small collection of cases or activities illuminates social life. Therefore, the primary purpose of sampling in this research was to collect specific cases, events, or actions that could clarify and deepen understanding of the research questions. It is the relevance of the selected cases, events or actions to the research topic, rather than their representativeness, which

determines the way in which the respondents to be studied were selected. For this reason, purposive or judgemental sampling techniques were used.

Since this research seeks to develop an understanding of the evolving approaches to managing coastal common pool resources that exist in Sulawesi, it aims to represent the case but not the wider population. A rich description of destructive fishing practices and of the mangrove conversion processes, as well as conservation activities on the study sites, representing key informants' ideas drawn from many different ways of thinking (schools of thought), allows for the consideration of broader policy, institutional and attitudinal issues in understanding the nature of the coastal resource management problems being addressed. Therefore, instead of generating an empirically-representative sample based on statistical or probability sampling, this research chose to sample purposively. Respondents in each case study area were selected on the basis of their relevance to the research question and analytical framework.

Purposive sampling was used to identify key informants in both government and community: that is, in the villages as well as at district, provincial and national levels. This sampling technique was also used to select individuals to learn about their experience with co-management and potential resource conflicts. Several key informants were then asked if they were willing to be interviewed to provide further detailed information on what they knew about activities relating to destructive modes of resource use, co-management efforts or other, alternative resource management regimes. These were mainly people living in the villages and involved in activities linked to coastal resource uses. In addition to these individuals, people to be interviewed were identified through their significant knowledge or involvement with the research subject. These ranged from academics to NGO activists and government officials.

Newman and McNeill (1998) argue that the more interviews, observations, and documents obtained by a researcher, the more evidence will accumulate, the more variations will be found while not necessarily guaranteeing any increase in the accuracy of description of the situation being investigated. Consequently, a researcher needs to look for events or conditions that are indicative of phenomena rather than counting individuals or sites per se.

4.3.3.2. Snowball sampling

Snowball sampling is a referral technique, whereby participants are asked to suggest other individuals who may be helpful to the study at hand (Babbie, 1995). This type of sampling begins with a few respondents available to the researcher who are asked to recommend other people who meet the criteria and who might wish or be willing to take part. This process continues until no more potential respondents are discovered or the researcher feels that all the required information has been gathered (Sarantakos, 1993).

The initial interviewees were selected on the basis of their role in reef fishing or mangrove conservation, and related activities such as the organizers of village cooperatives, shrimp farmers, fish traders, and government officials. Identification of subsequent interviewees was achieved by the snowball approach. Initial interviewees were asked to identify others who should be interviewed.

As the fieldwork progressed, the initial respondents in a selected village in a case study area were specifically asked whether they knew of other stakeholders or participants involved in a specific related activity to ensure that a wide variety of viewpoints was included. The snowball approach offered an effective way of identifying respondents. The final number of interviewees depends on the point at which 'theoretical saturation' is reached. In an ideal research situation there should be no monetary or time constraints on conducting the necessary number of interviewees. Lofland and Lofland (1995) observe that some studies have involved over 100 interviews, although most are based on approximately 30-50 interviews. They suggest that this is a reasonable number in most circumstances. In this study 111 respondents were interviewed.

4.3.4. Qualitative and Quantitative Data Collection Procedures

Qualitative data for this study was obtained through several techniques, namely observation, focus-group discussion and semi-structured in-depth interviews, whereas quantitative data was obtained from survey questionnaires. Secondary data are used to complement the primary data and to provide further detail on particular subjects related to the study needs. Such a combination of approaches is particularly appropriate for a study of this nature where no particular source of information has the complete picture of what is going on and an understanding of the situation can only be

established by putting the information pieces together, similar to completing a jigsaw puzzle.

In studying the nature of destructive fishing practices in coral reef areas as well as analysing the dynamics of mangrove utilisation, further recognition of the strengths and weaknesses of each of data acquisition instrument available is also important to allow effective use of appropriate methods of gathering the data needed within the scope of the time available. For this purpose, following suggestion of Baxter and Eyles (1997) to establish "rigour" in analysis, the data collection procedures in this study were designed to allow both qualitative and quantitative approaches to take place.

Table 4.2 Data acquisition sources and instruments employed.

Fieldwork Location	Data acquisition methods				Secondary Data
	Observation	Focus Group Discussion (FGD)	Survey Questionnaires	In-depth Interview	
Site 1	√	√	√	√	√
Site 2	√	√	√	√	√
Site 3	√	√	√	√	√
Site 4	√	-	-	√	√
Site 5	√	-	-	√	√
Site 6	√	√	√	√	√
Site 7	√	√	√	√	√
Site 8	√	√	√	√	√
Site 9	√	√	√	√	√
Site 10	√	√	-	√	√
Site 11	√	-	-	√	√

Note: '√' means this method was applied or the data were available while '-' means the data collection method was not applied or the data were not available.

Qualitative methods aim to discover the nature of phenomena as humanly experienced. This is achieved by ascertaining the thoughts, perceptions and feelings of people. In using qualitative techniques the researcher is able to find out how people give meaning to, and organize, their lives (Miniechiello *et al.*, 1990). However, many authors warn that the beliefs and feelings of the interviewees (participants) as expressed, and explanations they provide, can easily be treated as significant realities by the researcher (Chambers, 1997). To address this, the researcher needs to be equipped with better knowledge on the information sources' backgrounds, an ability to screen information, and to strive to cover as many sides of the story as possible (Biklen and Casella, 2007).

A range of data collection instruments were employed during fieldwork in each site. The implementation of the methods was very much dictated by the local conditions and situation in the field, including the numbers of people available to talk to depending on their work commitments and remoteness, the connections and positionality of the local contact, the configuration and dynamics of the different stakeholder groups, the community political and power structures encountered by the researcher, and the nature of the relationship established between researcher and the community. Table 4.2 presents the types of method employed in each site, and therefore the types of data available from these sites. Not all of the methods were able to be applied in each site. However, every necessary effort was pursued to establish well-grounded information and to cover as many aspects of each subject in relation to the research questions.

Quotes in the text are drawn from qualitative primary data. These quotes have been translated from the original language, either Indonesian or local dialects, into English. Every effort has been taken to maintain the integrity of the ideas and meaning of the information. In addition to the eleven sites examined, interviews were conducted with resource persons in Jakarta, Bogor and Makassar, which included a former government minister, senior ranked officials related to coastal resource management, academics, business people, and NGO members. In summary, the data was generated from 111 semi-structured in-depth interviews, 87 pieces of returned questionnaires, and 15 times of Focus Group Discussions with a total of 197 participants. In addition, a range of secondary data in the form of research and project reports, demographic and profile statistical data, and business profiles were consulted and became part of the source of data for this research.

4.4. CASE STUDY APPROACH

The use of case studies (as summarised in Figure 4.2) was a necessary and crucial part of this research in relation to the research purpose: to establish an appropriate management approach that is capable of addressing the conflict of interests of coastal resource use within the local contexts of the Sulawesi region. In addition, several other reasons were also considered to be relevant. First and foremost is the need to address conflicts of interest over the use of coastal resources. Such problems are site-specific, community-oriented and therefore must be examined

within their local context. These criteria can be addressed by the case study approach. Secondly, the interdisciplinary nature of this research made it necessary to employ appropriate analytical tools that can provide holistic analysis at the same time as offering a detailed prescription of multi-layered, multi-stakeholder coastal problems.

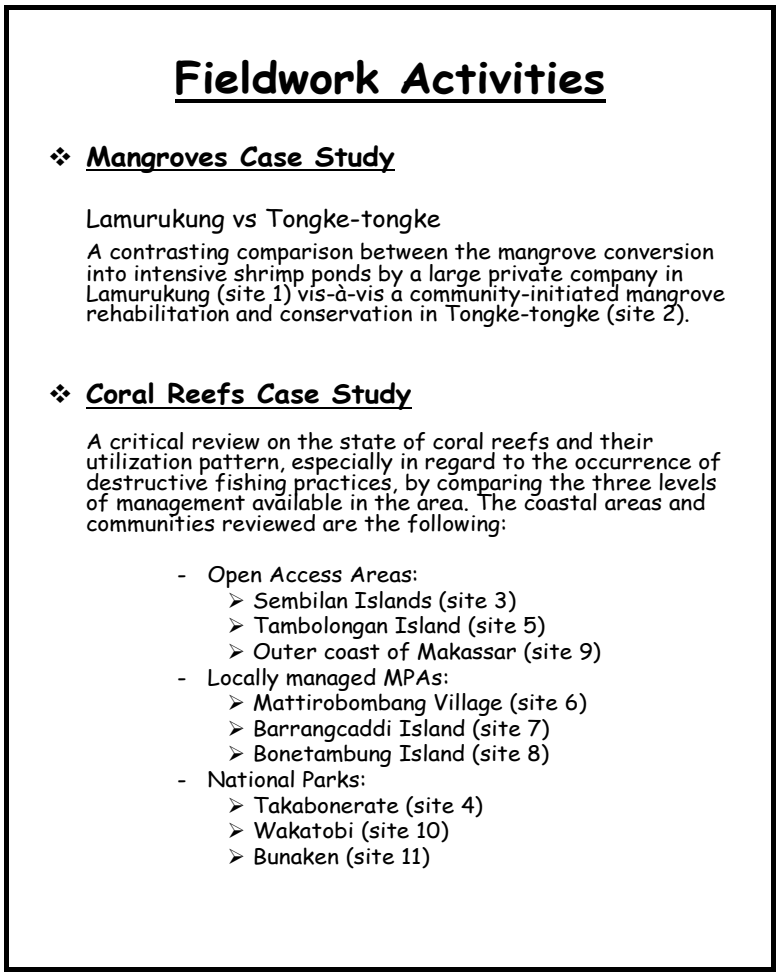

Figure 4.2 Structure of the fieldwork activities in the Sulawesi region.

Yin (1994) and also Babbie (1995) indicated that case studies are considered an efficient method to track changes in complex systems. Coastal resource management is certainly a complex phenomenon, and one way to overcome the challenge of constructing an understanding of it is to understand a particular set of situations thoroughly through case studies. Finally, the nature of the research made it necessary to combine quantitative and qualitative approaches to assess the interdependencies of the system's components in the coastal zone and to establish an integrated approach involving the multitude of aspects that exist in the coastal area.

The case studies implemented in this research provided opportunities to gain insights through in-depth examination of particular resources (particular cases) and to generate a holistic framework through a conceptual model of the system.

4.4.1. Coral Reefs Case Study

The coral reefs case study was primarily constructed to address the research questions in relation to destructive fishing activities, practices which mainly target the resource of coral-reef fishes but which leave the corals they are supported by victim of the effects of these practices. In addition, the case study looks into how communities appreciate the coastal resources in their vicinity and are able to use them to enhance their livelihood (Ostrom, 1993). An important component in this case study is the coral conservation efforts pursued, either from government's top-down or community's bottom-up approaches, in the form of marine protection area. Hilborn et al (2004) emphasised the importance of management of MPA in determining its success to achieve its conservation goals. Considering the breadth of problems relating to the management of coral reefs, it was decided to pursue the case study by classifying the sites being reviewed into three categories based on their apparent level or type of management: open access areas, local MPAs and national parks.

Open access areas

The open access areas are those marine areas in which no particular management regime is being implemented. Although they are actually not entirely unmanaged since local government is responsible for the marine area claimed under its jurisdiction, attention is generally insufficient to implement effective management. Three sites were examined and included in this category: (1) the Sembilan Islands region in Sinjai District or Site B ; (2) Tambolongan island in Selayar District or Site C ; and (3) the outer sea area of Makassar city or Site E.

It is predictable that any marine area in this category is generally suffering the impacts of destructive fishing practices (DFP) which include blast fishing and cyanide fishing. It is in this type of area that such activities take place due to their open access regimes and lack of surveillance. The state of coral reefs in Sembilan Island waters is much deteriorated due to DFP. In Makassar, similar conditions exist, although the problem is worsened by another process – that of pollution. In

Tambolongan, there are some spots that are left intact having been spared from DF. These spots are mainly close to the island, whereas the further out to the sea one looks, the more impacts from DFP can be found.

Locally Managed MPAs

Local people have unilaterally designated certain areas as Marine Protected Areas (MPAs). An MPA has its own regulation or local act, enforced by the local community, and this usually involves some form of use limitation such as a no-take zone. The effectiveness of their management regime thus depends very much on the attention given by the local communities. Three sites were examined and included in this category: Mattirobombang Village or Site D, Barrang Caddi Island or Site E, and Bonetambung Island also in Site E.

Many of the contemporary local MPAs in Indonesia were established with significant involvement of 'outsiders' to the community, people such as academics or NGO activists trying to induce environmental awareness in the community by introducing the idea of an MPA. The MPA was then built hand-in-hand with the community, although in some cases the locals may not have been clear about why one was seen as needed or, if they did see a purpose for the MPA, they did not necessarily believe it was going to provide a successful answer to their coastal management or resource problem.

The three local MPAs that I investigated in this research were all managed by local communities, yet it was not their idea to have one: rather it was an idea introduced from outside by academics. Despite this commonality, the outcomes were not the same. The Mattirobombang MPA went 'out of business' less than a year after it was officially inaugurated by the Regent (head of the district). The Barrang Caddi MPA lasted about a year. It managed to demonstrate an improvement in fish biomass within the protected area - so pronounced was this improvement that the area became a focussed target of destructive fishing practices. Because of this occurrence, other members of the group lost their faith and discarded the MPA ideas. This is an example of the old 'prisoner's dilemma'[1], where collaboration is necessary but will have to

[1] The Prisoner's Dilemma constitutes a problem in game theory. In the classic form of this game, cooperating is strictly dominated by defecting, so that the only possible equilibrium for the game is for all players to defect. All things being equal, no matter what other players do, one player will always gain a greater payoff by defecting. Since in any situation defecting is more beneficial than cooperating, all rational players will eventually be defecting.

face the challenges of collective trust (Ostrom, 1990). The In contrast, the Bonetambung MPA managed to survive into its second year and was still going well on my last field visit. Unlike the other locations which had much greater populations, the Bonetambung island community of 70 people seemed to be more cohesive and agreeable to MPA management.

National Parks

National Parks are those areas that have been designated by the National Government, through a ministry-level decision, as National Parks. These parks operate on a government budget and have their own institutions and facilities such as boats and park rangers or *jagawana*. Three sites were examined and included in this category: (1) the Taka Bonerate National Park or Site 3; (2) the Wakatobi National Park or Site 10; and (3) the Bunaken National Park or Site 11.

Although they all are government funded and have their own facilities, the effectiveness of park management is quite varied. Besides funding and facilities, accessibility seems to play a significant role. Taka Bonerate is the most-remote location of the three, and seems to have lagged behind in its management. It takes a nine hour boat trip from Benteng, the Selayar District capital, to reach this site whereas Bunaken is only a thirty-minute to one-hour boat trip from Manado city, the capital of North Sulawesi Province. Bunaken has been gaining in popularity as a tourism diving destination. Wakatobi seems to fare somewhere in between these other two examples. It takes a six hour boat trip from Buton, the nearest town on the mainland, to reach this site. Wakatobi however has recently become a self-administered district and this change in local governance is expected to improve the Wakatobi MPA management. It is interesting to note that Bunaken management policy appears to have emphasised tourism more than the conservation of the coral, whereas Taka Bonerate management appears to put more emphasis on conservation.

In casual usage, the label "prisoner's dilemma" may be applied to situations not strictly matching the formal criteria of the classic or iterative game. For instance, those in which two entities could gain important benefits from cooperating or suffer from the failure to do so, but find it merely difficult or expensive, not necessarily impossible, to coordinate their activities to achieve cooperation (Plous, 1993; Chess, 1988).

4.4.2. Mangroves Case Study

This case study examines the utilization pattern of mangroves by investigating what has happened in two sites with very different directions in mangrove usage. It considers the implications of these differences from a resource management perspective. The case study looked at Lamurukung Village (site 1) and Tongke-tongke Village (site 2). Both villages are located on the east coast of South Sulawesi peninsula, facing Bone Bay. The distance between the two sites is approximately 100 km of coastline from Lamurukung in the north to Tongke-tongke in the south.

Lamurukung plays host to PT.SAU, a private company that came to invest in 1988 by building a vertically-integrated facility to produce Tiger Shrimp (*Penaeus monodon*) for export. The facility was a state-of-the-art, large-scale shrimp production complex consisting of a shrimp hatchery, a feed mill, cold storage, and an approved concession for 545 ha of intensive shrimp ponds. For phase 1, the company built 125 ha of the ponds, mainly from converted wetland areas with a mixture of mangroves and nipah vegetations but with some converted from old, low-productivity ponds once owned by locals. The company started to produce shrimp in 1990 and sourced a great deal of its workforce from Lamurukung and its vicinity. The locals were mainly employed as labourers, with very few as middle management.

Peak production was achieved in 1994 when pond technicians managed to produce an average of 10 tonnes of shrimp per hectare per season for the whole 125 ha pond area. This certainly appeared to be an achievement in comparison to traditional ponds that only produce an average of 300 kg per ha per season, or one thirtieth of that productivity level. Everything seemed to be going well, and a plan to build another 250 ha was being prepared as Phase 2 when suddenly the *illuminous disease*, a type of shrimp disease caused by the Monodon Baculo Virus (MBV) hit the area and became a pandemic, quickly reducing production. By 1999 most of the workers had been laid off and in 2000 the company was closed and filed for bankruptcy in the midst of the economic crisis that was simultaneously enveloping Indonesia. When I visited the site in the end of 2005, the business was still on the market but no one has expressed any serious interest.

Tongke-tongke on the other hand provides a different take on mangrove utilization. In the early 1980s Tongke-tongke village was perched right next to the open water of Bone Bay. The village was on the brink of elimination, as the coastline

was eroding and moving inland. During high tides Tongke-tongke became part of the sea, with seawater flowing into the village and underneath the tilt houses. Faced with the possible consequence of losing their village to the sea, the community decided to do something about it themselves. In 1985 they started to plant mangrove seeds that they picked from neighbouring places along their coastline. The effort was organized seriously by the community so that within three years their coast had been covered with mangroves. This mangrove planting was still being carried on at the time of my last field visit in 2007. When I visited the place in the end of 2005, it took almost one hour to paddle a small canoe out to the open sea from where it used to be on the brink of the village land in the 1980s. In 1992, the Tongke-tongke community was awarded *Kalpataru,* a prestigious environmental award from the National Government, in recognition of their self-initiated environmental rehabilitation efforts.

4.5. CONCLUSION

This research is grounded in two case studies which examine mangrove and coral reef utilizations. Analysis of the use of these coastal resources in Sulawesi was conducted through eleven field sites, chosen based on their particular resource, resource-management, community and administrative characteristics. Two sites specifically represented the mangrove case study while nine sites represented the coral reef case study. The total eleven field sites are, thus, the unit of analysis for this research.

Qualitative and quantitative data were collected during fieldwork. Triangulation of data sources was used as a primary approach to data collection. Data was collected from multiple sources of evidence: observation, focus group discussions (FGD), semi-structured in-depth interviews, and questionnaires. In addition, secondary data were used to complement the primary evidence. Field observations and interviews were conducted in all sites, with FGD and questionnaires conducted in eight and seven sites respectively. The findings from this research are presented in the next two chapters. Results from the coral reef case study are detailed and discussed in Chapter 5 while the mangrove study is dealt with in Chapter 6.

PART 2. RESULTS AND ANALYSIS

CHAPTER V. DESTRUCTIVE FISHING THREATS TO CORAL REEFS

5.1. INTRODUCTION

Part two of this thesis consists of two chapters. Each chapter presents one of the two case studies conducted in the field. Results and analyses from the coral reef case study are presented in this chapter, while the mangrove case study results are dealt with in the following chapter.

The coral reefs case study deals with destructive fishing practices (DFP) which are widely conducted in the Sulawesi region. The research questions addressed in this chapter have been introduced in Chapter 1. These questions deal with the destructive methods practiced in utilising the coral reefs. The following three research questions lead the inquiry into this coral reefs utilisation pattern: *What are the rationales behind blast and poison fishing activities?; How do blast and poison fishing differ in their impacts on coral reefs?; Is the state of local coral reefs associated with their use in multiple ways and with other potential conflicts within the local community and, if so, how?*

This chapter starts by presenting the general condition in the nine study sites where the case study took place, followed by a description of general trends in DFP in Sulawesi. This section traces the origin, method of operation and reasons for the widespread occurrences of DFP. It analyses the stakeholders involved in DFP and attempts to unravel the intricacy of the network structure in which they are embedded. This is necessary in order to explain why it is so difficult to bring DFP under control. A discussion of the DFP problematique, framing it within the sustainable livelihood discourse, is offered in the end.

A key point addressed in this chapter is why combating DFP has been frustratingly unfruitful. It is a complex problem which is rooted in issues such as poverty, lack of community awareness, and the short time horizons of the economic interests involved. These matters do not operate in isolation and often it is a combination of the economic interests and the nature of resource reliance within

particular places that leads to conflict within communities. This makes DFP even more difficult to resolve.

5.2. GENERAL TRENDS OF DESTRUCTIVE FISHING PRACTICES

The coral reefs of Indonesia, especially in Eastern Indonesia where Sulawesi region is included, have been considered as among the most diverse in the world (Nontji, 2002; Wilkinson, 2000: Bechtel, *et al.*, 2004). However, they are also among the most threatened by human induced impact, especially through the widespread use of destructive methods of fishing. For many years some fishermen, locals and from outside of the region, have used blasting and/or poisoning in these coral areas as a speedy, inexpensive yet effective method of obtaining the fish they seek. These illegal methods of fishing with chemicals and dynamites have been practised for a number of decades, and have been so widely used that much of the damage has resulted in bringing some areas to the point of complete habitat-wide collapse (Edinger et al., 1998; Soeharsono, 2000; COREMAP, 2006).

DFP, as defined by Pet-Soede and Erdmann (1998, p.29), includes any activity that "results in direct damage to either the fished habitat or the primary habitat-structuring organisms in the fished habitat (e.g. [reef building] *scleractinian* corals in a coral reef fishery)"; such activities include chemical and blast fishing, anchor damage, trawl fishing, fishing with fine mesh gill nets, and "weighted scare lines", locally know as *Muroami*.

The development of global trade, the steady modernization of economic systems and continued increase of population have all contributed to a radical alteration of the exploitation pattern of marine resources in developing countries. Following the progress of modern technologies in fishing methods, instead of using the traditional hook-and-line or the conventional set-nets, fishermen venture offshore using boats equipped with engines and different models of nets. Due to a high market demand for fish, people have adopted high technologies such as GPS and electronic fish finders to expand their catches. Indeed, fishing in these waters has become part of a worldwide fishing industry and a global market. Increasingly, people are fishing in response to growing global market demand (Berkes and Turner, 2006; and Bell *et al.*, 2006). Supported by intensive capital, fishermen apply different fishing methods to catch fish. Unfortunately, many of these methods proved to be destructive.

Within the field sites studied, most of the reef-associated fishery exploitation is based on two types of destructive methods: the use of explosives and/or cyanide. The main reason for these choices, as revealed by interview results, has been their effectiveness, less time consuming than traditional methods and being comparatively cheap. Although these methods involve some danger to the operators, they are perceived as relatively easy methods, especially in terms of handling the catch. The Global Coral Reef Monitoring Network estimated that more than 53% of Indonesia's coral reefs are threatened by DFP (Wilkinson, 2008).

Since these techniques have been used for more than a generation, many fishermen know no other means of catching fish. Comments from field interviews indicated that blast fishing, in particular, has become so pervasive in Indonesian coral reef fisheries that it may, in some respects, be considered a "traditional" fishing method. DFW (2003) estimated that if these techniques continue unabated in the wider region, by 2020 all coral reefs in Asia-Pacific will be totally destroyed.

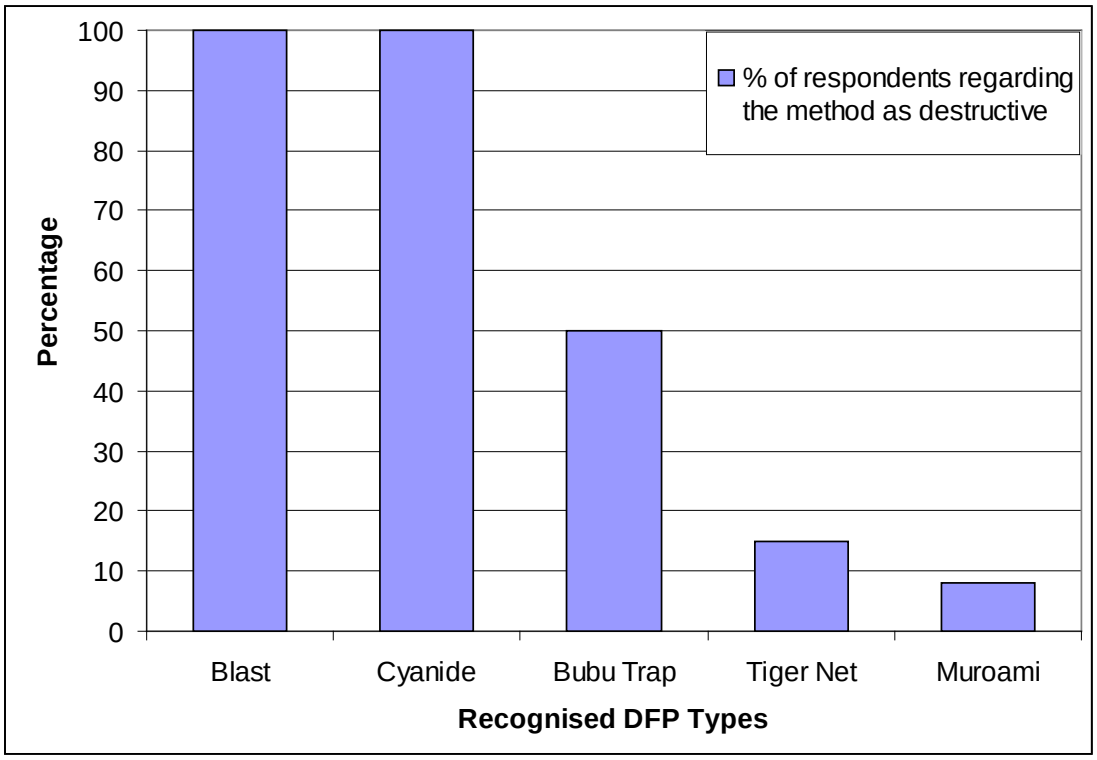

Figure 5.1. Fishing methods known to local people and considered to be destructive.

Although not as intensely used as the blast and cyanide fishing methods, other types of DFP have also been observed and reported in Indonesia (Halim, 2002; Pet-Soede and Erdmann, 1998; Fox et al., 2003; Prasetiamartati, 2007). These include the artisanal use of very fine mesh nets, generally termed 'trawl', taking juvenile fish before they can reproduce; the actual digging and extraction of corals; the collection of endangered marine species; and the use of coral to conceal fish traps. Figure 5.1 illustrates the significance of the two main DFP in relation to the recognised range of destructive fishing types in the field sites. This data is derived from the community surveys which were introduced in Chapter 4.

Although blast fishing has a long history in the region and poison fishing is a much more recent phenomenon, other destructive methods also exist. The bubu trap is a very traditional method of fishing by replacing a section of corals with a trap. This is used to capture bottom dwelling species such as crabs and *ciganideae* fishes. Being only a trap however, it is not as destructive as the two main methods. A tiger net is a minitrawl used to catch all types of species. It has a destructive effect by its action on the coral reefs and other bottom organisms. This was the first method of DFP to be outlawed, in 1980 (Yusran, 2002). *Muroami* is a low efficiency method borrowed from the Japanese that involves fishers standing at points holding a weighted net close in to the beach into which fish are herded or "scared" and surrounded. Of all these methods, blast and cyanide fishing remain the most widely used, and therefore have the greatest negative impacts on the corals ecosystem.

An important aspect in examining the dynamic of DFP is their widespread occurrence and intensity. These are direct responses to the high demand for fish in the market. Therefore, it is important to understand the marketing processes of the harvest from these practices. Figure 5.2 shows the marketing chain of fish harvested from blast fishing practices, while Figure 5.3 presents the marketing chain related to poison fishing harvests. In addition, Figure 5.4 shows an example of these two DFP in action, while Figure 5.5 presents a comparison between coral reefs in good condition and the one that had been assaulted with DFP.

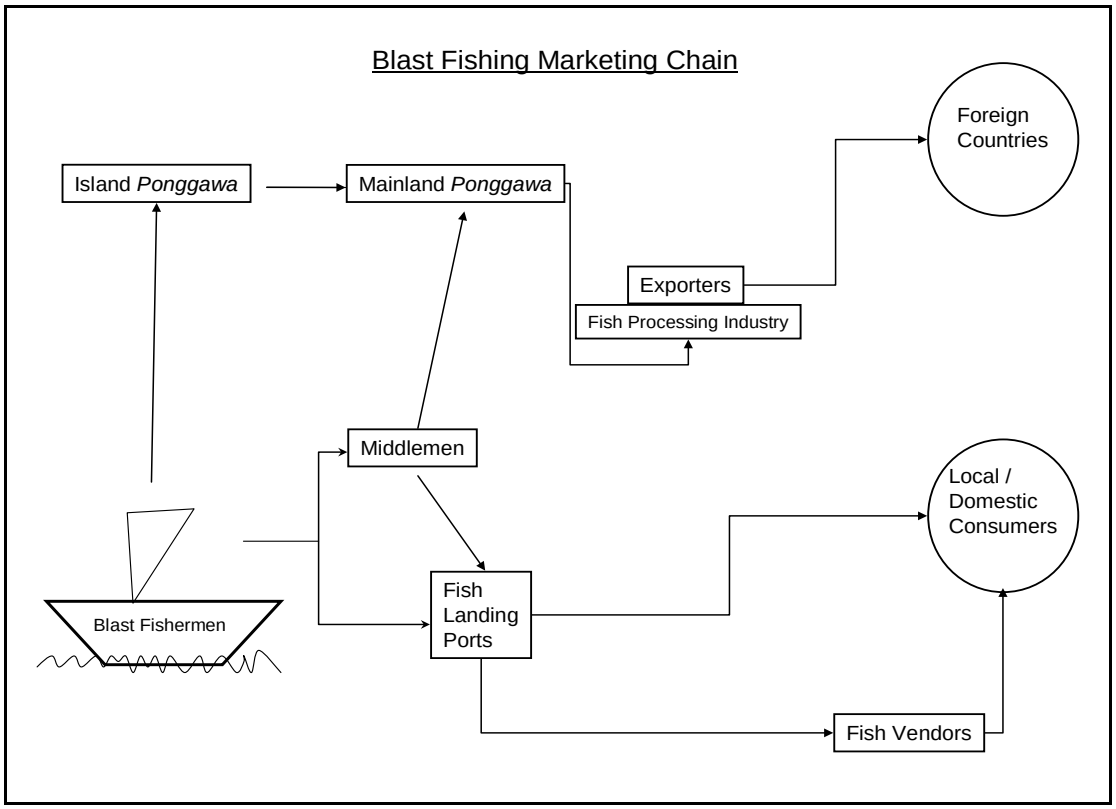

Figure 5.2. The blast fishing marketing chain where more than 80% of products are for domestic consumption and only a small part is for the export market.

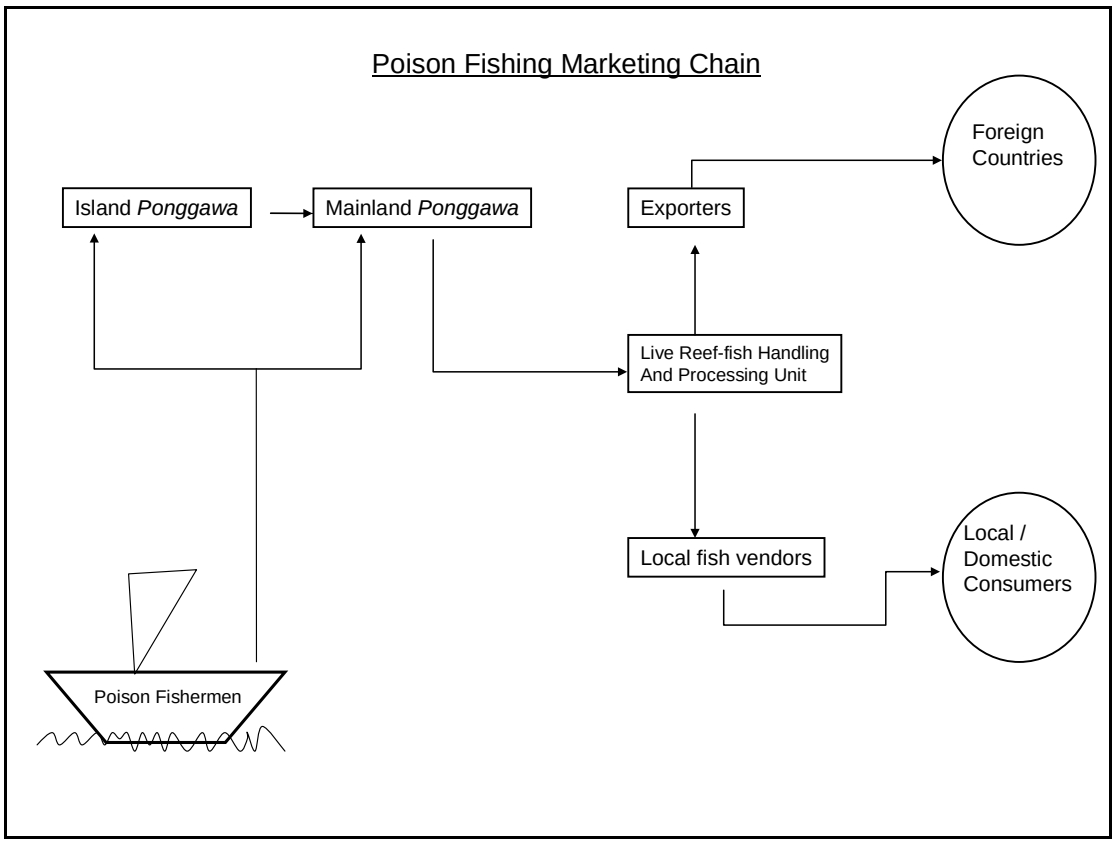

Figure 5.3. The poison fishing marketing chain where more than 80% of products are for the export market and only small part is for domestic consumption.

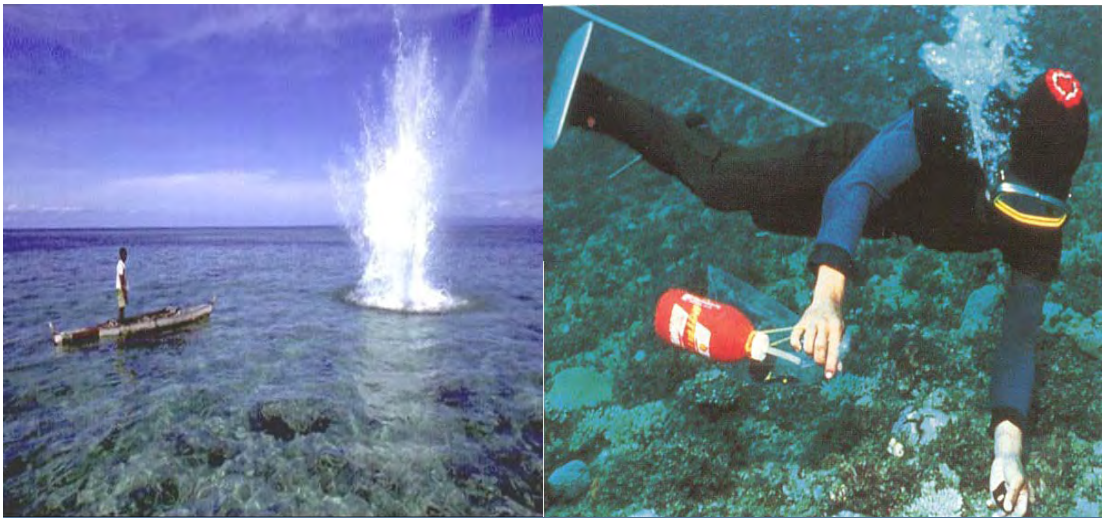

Figure 5.4. An example of blast fishing (left) and poison fishing (right) in action (Source: courtesy of CCRR-Unhas).

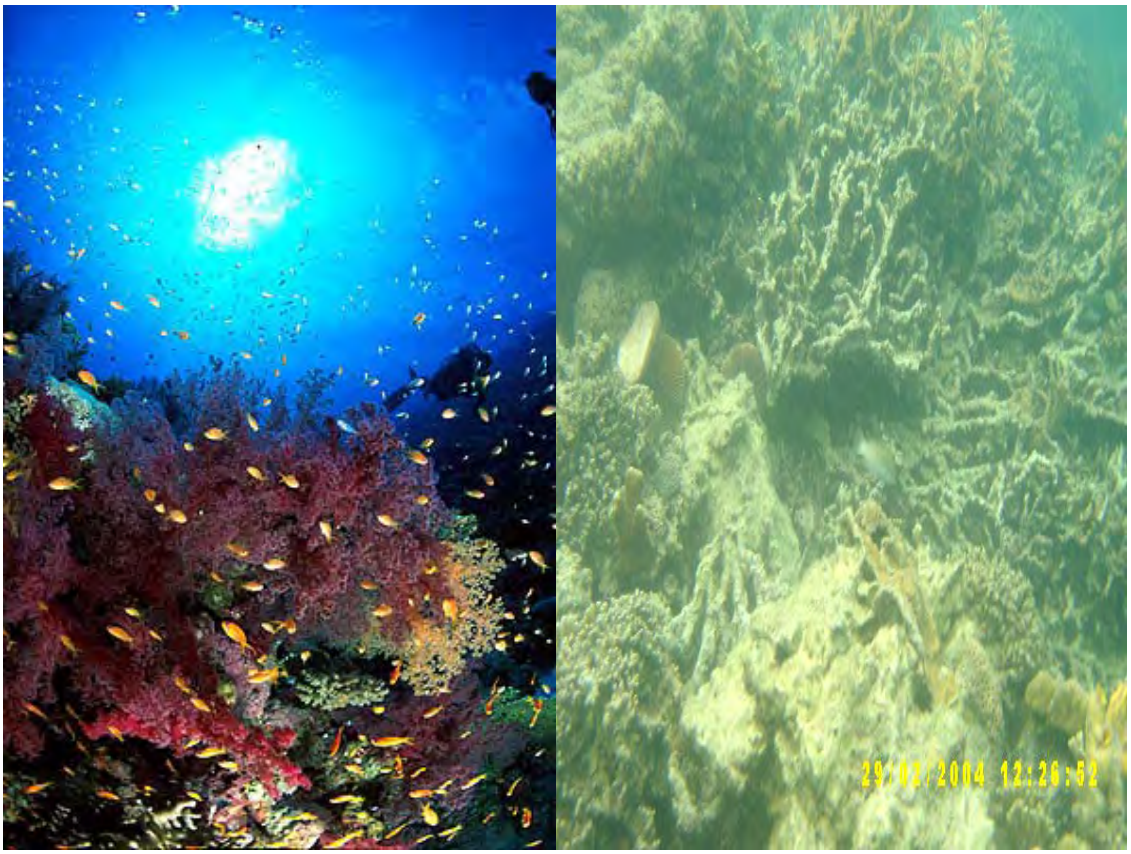

Figure 5.5. Before and after blast fishing. The picture on the left shows coral reefs in a good state with live coral cover and a diversity of fish, whereas the picture on the right contradicts the earlier one. This shows the situation after blast fishing which leaves the area with nothing more than rubble of dead corals. (Source: author's private collection).

Significant market differentiation exists between the two methods of fishing. In fact, their target markets are entirely different. A majority of the fish harvested from poison fishing operations is targeted for export, and only very small proportion stays for the domestic market (local and national). On the other hand, the majority of blast fishing harvest services the domestic market, mainly at the local level, a small portion enters the national market, while very little of the harvest may end up for export. The reason that fish from blast fishing operation is not exported is their poor physical condition. The fish tend to be broken and easily deteriorate. The nature of the products market can have an important role in designing strategy to combat these practices. For example, adopting the Green Label (environmental awareness certification system) may work effectively to combat poison fishing with foreign-targeted markets, but may not work as well for the blast fishing, since the majority of blast fishing product goes for local consumption where consumer priority is price.

There is no reliable data available on the composition of the target market for both types of fish harvests. This is understandable considering that both blast and poison fishing are illegal fishing methods. Investigations in the field however indicated that over 80% of the poison fish harvest is going to foreign countries with only very small amounts (up to a maximum of 20%) marketed domestically. Conversely, it is safe to assume that at least 80% of blast fishing harvest is consumed in the domestic market.

Examining the marketing channel of the harvest is also crucial in identifying the actors involved in this enterprise. In analysing the actors in the marketing chain on both Figure 5.2 (blast fishing) and 5.3 (poison fishing) one can identify the important relationships between the fishermen on the sea (field operators) and their leader on the island or in the mainland. This is not just a buyer-seller relation. The relationship is more intensive and goes beyond a mere trading partner. The trade relationship is embedded within the original relation that one would categorise as a Patron-Client relationship (Yusran, 2002). A patron-client relationship is an informal institution that serves as a social arrangement to maintain and protect livelihood security involving an asymmetric relation between a local leader (patron) and his workers/subordinates (clients).

It is important to pay attention to this type of relation especially since, as we will see later in this Chapter, the dynamic of this relationship defines the intensity of

DFP. Figure 5.2 and 5.3 capture the activity of this patronage institution, locally known as *Ponggawa-Sawi*. The *Ponggawa* is a patron who finances his own fishing enterprise, and recruits members of his own ethnic group or village to work as labourers. Meanwhile, the *Sawi*s are the people who work as labourers for the *ponggawa*. The *ponggawa-sawi* social arrangement has a long history in both the fishing and the agricultural communities in Sulawesi (Meereboer, 1998). The ponggawa-sawi arrangement as a basic patront-client relationship exist not only in fishing and agricultural communities, but have been part of the cultural dynamics in Sulawesi region that it had permeates into almost all economic activities at community level in the region. Dean Forbes, for example, found this ponggawa-sawi system within the informal economy in urban areas, among the pedlars and trishaw riders in Makassar (Forbes, 1981)[2].

Despite its perceived benefits in providing long-term social stability, this patronage relationship has been criticised for maintaining the status quo, and thus hindering community economic development because of the manner in which it severely limits the material improvement of the *sawi* and their families (Streich, 2001; Haff and Stiglitz, 1993). Furthermore, Sallatang (1983) notes that as long as the *ponggawa* controls the capital in a fishing community, he is likely to control the introduction and use of any modern technical innovations pertaining to the local fishing industry. This strengthens the *ponggawa's* economic position while diminishing that of the *sawi*. This power relationship has important implications in defining the intensity of resource utilisation and sustainability. This in turn defines the level of livelihood for the people of the area.

a. Blast fishing

Blast fishing practices in the Sulawesi region can be traced back to the time of Japanese occupation during the Second World War. Interviews with fishermen conducted at the field sites confirmed that Japanese troops required local residents to dive in order to collect the fish killed after they blasted the reefs. After the Japanese occupation, an abundant supply of bombs was left behind. These were stored in many areas, but particularly around Southeast Sulawesi, Papua and Moluccas islands (Boomgaard, 2007). During the 1960s and 1970s, blast fishermen still used these left-

[2] For further assessment on this Ponggawa-Sawi arrangement, please see Sallatang (1983) and the more recent one by Yusran (2002).

over bombs, but in the 1980s new materials and techniques were adopted. They started to use home-made bombs such as those constructed from kerosene and ammonium nitrate fertilizer in bottles. These were also known as ANFO (ammonium nitrate/fuel oil) bombs (Chozin, 2008).

The blast method is widely practiced and is a quick and cost effective way of catching fish. In essence, ammonium-nitrate fertilizer-fuel bombs are thrown into schools of fish. Blast fishing operators hunt specifically for schooling fish to maximise impact, then they dive after the explosion to collect dead and stunned fish. The blast bursts the swim bladder and kills the fish. Dead fish then float to the surface and are harvested. However many of both target and non-target species sink and are lost.

This type of DFP method causes long term environmental problems. It damages coral reefs, kills untargeted fish, and is dangerous to the fishermen themselves. Blast fishing not only kills fish but also destroys coral reefs near the detonation site. There have been estimates that regular blast fishing in one area can kill 50 to 80% percent of the coral reef (Fox et al., 2005). A blast from this DFP, on average, left a crater between 2 to 10 m in diameter and up to 2 m depth (Fox and Caldwell, 2006). In addition to damaging coral reefs, the destructive fishing practices have a tremendous impact on fish stock itself. In the long term, fish stock decrease since the reef fish habitats, and especially their spawning grounds, have been ruined (Edinger *et al.*, 1998).

b. Cyanide fishing

Poison fishing, also known as cyanide fishing because of the use of potassium cyanide, is an effective method of capturing valuable reef-fish alive such as wrasse, groupers and lobsters. Fishermen, with potassium cyanide solution in bottles, dive into the water and squirt the solution into the holes and crevices in the reef inlets between the coral reefs (Halim, 2002). This method is destructive because the cyanide used to stun fish bleaches the surrounding coral reefs. The cyanide kills the polyps that create and reproduce the corals. It is further unsustainable for the fish themselves because its target is often the breeding population of the fish (Pet-Soede *et al.*, 1999).

Poison fishing or cyanide fishing was introduced by foreign fish importers who came to Indonesia to pursue the supply of live reef fish. Interviews at field sites

with fishermen who practice this method, indicate that cyanide fishing was being adopted by local people via entrepreneurs from Taiwan and Hong Kong at the beginning of the live food fish industry in the mid 1980s. A cyanide solution is used to stun the target fish to make their capture easy. These entrepreneurs brought in fishing vessels specially equipped to handle live fish, and divers to pursue reef fish in order to supply the high demand for exotic live fish in upmarket restaurants in East Asia. In the operation, they involved local people who were encouraged to adopt the new method. In many parts of coastal Sulawesi and Maluku, this "technology transfer" took place soon after the start of the new live fish industry.

Poison fishing quickly proliferated into other places where local people pursued exotic reef fish for live supply such as for the aquarium market in Europe and America. Nonetheless, the high market price for live fish, either for aquarium or fresh sea food, was very attractive and become the main motivation to practice poison fishing. Alder and Christanty (1998) reported that live fish prices were ten times more profitable than the same type of fish non-alive. High market demands for ornamental fish and live fish for restaurants in the USA, Japan, and Hong Kong have been responsible for the proliferation of this practice. Under Indonesian law (Act No. 9 of 1985 regarding Fisheries, which then renewed into Act No. 31 of 2004) the use of poisons, including cyanide, to catch live fish is illegal. However, present circumstances in the live fish industry, with such huge market demands and high financial rewards, appear to favour the expansion of this practice among fishermen.

It is unclear which of these two common modes of DFP (blast and poison fishing) is the most damaging to the environment. From physical observations on site, as has been shown earlier, it is clear that damage caused by blast fishing is more obvious than that attributable to poison fishing. Nevertheless, in terms of market pressure, poison fishing exerts a greater pressure since it is directed towards the international market, whereas the blast fishing is mainly for the domestic market. An overseas consultant interviewed during field work said:

> I have this rough calculation, that blast fishing is at least 7 times more destructive than cyanide fishing. Although there is also an argument that cyanide accumulation may have a longer lasting impact than blast fishing. (MRE, personal communication, Bunaken, 7 October 2005).

There have been several studies undertaken to see whether coral reefs subject to blast fishing can recover (see Fox et al., 2003, and Raymundo et al., 2007). One of the researchers in Fox et al. (2005) said:

> A small, isolated blast in a coral colony may recover within five years without any significant reduction in biodiversity. However, large scale destruction that leaves the whole coral in rubble does not regrow even after ten years. (RLD, personal communication, Makassar, 13 September 2005)

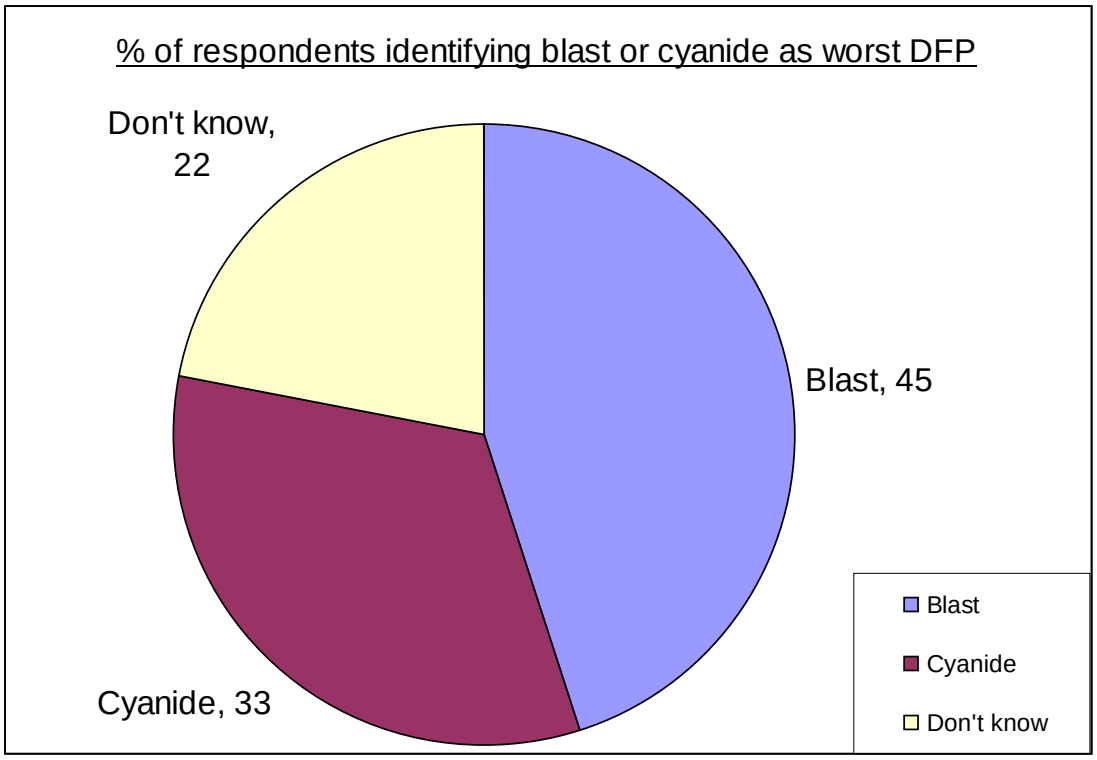

Figure 5.6. Comparison between poison and blast fishing in community perspective.

Community perceptions, as illustrated in Figure 5.6., shows the difficulty respondents had in identifying which of the two DFP is the most destructive. Some people see blast fishing as more destructive because it is immediately visible, while others are more concerned about cyanide fishing. This is because fish caught in this way are usually sold in the export market and therefore affect a far wider range of people than the domestic users of the products of blast fishing.

5.3. ECOLOGICAL AND SOCIAL DYNAMICS LINKED TO DESTRUCTIVE FISHING PRACTICES

The first part of this section presents the result of observations in the study sites related to the practices of destructive fishing. The second part integrates these observations using parameters derived to assess the overall state of coral reef resources. As previously discussed in chapter 4 (Methodology), this case study was conducted in nine sites. These study sites are classified into three categories: the National Parks, the Locally-initiated MPAs and the "Open Access" areas. Three sites were selected for each category. The following paragraphs discuss the nature and extent of DFP observed from each site.

5.3.1. Dynamics of DFP in the Study Sites

The National Parks

National Parks are areas that have been designated by the National Government, through a ministry-level decision, as National MPAs. These parks operate on a government budget and have their own institutions and facilities, such as boats and park rangers, locally known as the *jagawana*. Three sites were examined and included in this category: (1) the Taka Bonerate National MPA or Site 3; (2) the Wakatobi National MPA or Site 10; and (3) the Bunaken National MPA or Site 11.

Although they all are government funded and have their own facilities, the effectiveness of park management is quite varied. Besides funding and facilities, accessibility seems to play a significant role. Taka Bonerate is the most remote location of the three, and seems to have lagged behind in its management. It takes a nine hour boat trip from Benteng, the Selayar District capital, whereas Bunaken is only a thirty minute to one hour boat trip from Manado city, the capital of North Sulawesi Province. Bunaken has been gaining in popularity as a tourism diving destination. Wakatobi seems to fare somewhere in between the two. It takes a six hour boat trip from Buton, the nearest town on the mainland. Wakatobi however changed in 2004 from a sub-district to become a self-administered district. This change in local governance is designed in part to improve the Wakatobi MPA management. It is interesting to note that Bunaken management policy puts more emphasis on tourism as

a way to enhance the conservation of the coral reefs, whereas the Taka Bonerate management plan puts direct emphasis on conservation (COREMAP, 2003).

a. Taka Bonerate National Park (Site 4)

In Taka Bonerate, the proliferation of destructive fishing has mostly been due to external fishers originating from other districts, including Sinjai, Makassar and Pangkep (which are also part of the study sites in this research).

Local people indicated during interviews that as early as the early 1960s outside fishers were accessing Taka Bonerate, especially residents of Sinjai, Butonese from Southeast Sulawesi, Palue people from Flores, and the Balinese. The Butonese, Palue people, and the Balinese exploited most of the resources, including many protected species, such as green turtles, giant clams, and black corals. Fishers from outside of the area, such as from Sinjai, Madura and Palue (places that are more than 200 km away), were noted both by local people and officials interviewed during fieldwork for their destructive fishing practices and lack of respect for traditional management practices. This problem has resulted from differences in perspectives in relation to existing local norms. Outsiders tend to downplay the local norms and do not feel obligated to comply. In respect of the theory of the commons in Chapter 3, this appeared to be the challenge of enforcing local rules when there are outsiders acting as *free riders*.

In the mid to late 1970s, owners of large commercial live fish industries from Makassar commenced operations in the area. Since 1985, the numbers of fishers from other areas such as Flores have increased. Taka Bonerate has been overly exploited by the live fish trade seeking popular restaurant fish, and poison fishing has been employed here since the late 1980s. These traders have a contractual relationship with the buyers abroad, especially in Singapore, Hong Kong and Taiwan. Therefore they are under immense pressure to achieve their targets, hence their application of destructive methods. Subsequently, residents have responded to the pressure on their livelihood from outside fishermen by engaging in high-yielding but destructive practices too.

b. Wakatobi National Park (Site 10)

Wakatobi Marine National Park covers a seascape of 1.39 million hectares, and is the second largest Marine Park in Indonesia. Officially named the Tukang Besi Archipelago, Wakatobi is an acronym of the four largest islands (Wangi-wangi, Kaledupa, Tomian and Binongko) that make up this archipelago. These four islands also serve as the main islands within this complex of islands. Wakatobi lies in the middle of the coral triangle which is the centre of world biodiversity for reef-forming corals. The population of the four main islands is 100 000 people, who live dispersed amongst 64 villages. Their main occupations are fishing and farming.

The situation with DFP in Wakatobi is similar to that in Taka Bonerate, in other words it is also threatened with activities by fishermen from outside. The difference however is that, as above, Wakatobi is now a self administered district. As a result the district has access to more money for monitoring of fishing and prevention of DFP. There has also been some attention to strategic development, such as tourism, to provide alternative income streams (BAPPEDA Wakatobi, 2005).

c. Bunaken National Park (Site 11)

The Bunaken National Park, a marine park located on the northern tip of Sulawesi Island, is part of North Sulawesi Province. The park was established in 1991 and consists of 75,265 ha of seascape around the Bunaken Archipelago, which includes the Bunaken, Manado Tua, Siladen, Montehague, and Nain islands. Erdmann *et al.*, (2004) indicated that dive tourism provides an alternative to destructive fishing methods for the local community. It is a great source of revenue for people living in and around Bunaken National Park. Scaps (2005) estimated that non-local tourists visiting Bunaken constitute a recreational value of approximately USD 328/person/year. Based on 1996 figures, he further estimated that when aggregated with other economic multiplier effects, dive tourism brought in USD 4.2 million/year to Manado area.

One effect of the development of tourism has been a greater awareness amongst local people of the economic value of the fishery. Consequently fishing in this national park is much less reliant on DFP, as the fish stocks are shared between this industry and tourism. The nearby area of Bunaken was also a site of a USAID-

funded management project run by The Nature Conservancy, an international environmental NGO. It was a trial project based on ICZM principles (Crawford et al., 2004).

The Locally Managed MPAs

Certain areas have been designated as Marine Protected Areas (MPAs) in places where local people had been prompted to do so with encouragement from outside intervention, such as NGOs and academics. An MPA has its own set of regulations or local act, enforced by the local community, and this usually involves use limitations such as no-take zones. The effectiveness of management therefore very much depends on the attention given by the local communities. Three sites were examined and included in this category: Mattirobombang Village or Site D, Barrang Caddi Island or Site E, and Bonetambung Island also in Site E.

Many of the contemporary local MPAs in Indonesia were established with significant involvement of "outsiders" such as academics or NGO activists trying to induce environmental awareness into the community through the idea of an MPA. The MPA was then built hand-in-hand with the community, although in some cases they may not have understood why one was needed, or if they did understand, they did not necessarily believe it was the answer to their problem. The three local MPAs investigated for this research are all managed by communities, yet it was not their idea to have one: rather it was an idea introduced from outside by academics. The outcomes in each case, however, are not necessarily the same.

The Mattirobombang MPA went "out of business" in less than a year after it was officially inaugurated by the Regent (head of the District). The Barrang Caddi MPA lasted about a year. It managed to demonstrate an improvement in fish biomass within the protected area. So pronounced was the improvement that it became a target of destructive fishing practices from some members of the MPA group. Because of this, other members of the group lost faith and abandoned the MPA ideas. This is an example of the old "prisoner's dilemma" in which collaboration is necessary but has to face the challenges of collective trust (Ostrom, 1990). The Bonetambung MPA however has managed to survive; in its second year it was still going well. Unlike the other locations which have a lot more population, the Bonetambung island community

of 70 households seems to be more cohesive and therefore more amenable to MPA management. Nonetheless their enthusiasm for the MPA has now drained away.

a. Mattirobombang Village (Site 6)

This MPA was the best funded of three examined in this study. But it lasted only as long as the funding was available, and this was essentially for an initiation project. It was carried out according to the ICM text book, involving the use of an outside expert. After discussion, the MPA site was identified by local people with help from the expert, followed by training to encourage the people to manage the MPA as their own, with the mayor being inaugurated as formal leader.

The MPA lasted for approximately one year. The local arrangements established to manage the MPA were not sustainable, for two main reasons. The first was that finance ran out at this point, and the second was a lack of local interest. As several respondents indicated, people did not see the need for this MPA:

> I think, most of the people in this village don't understand what an MPA is for and why they need it. Furthermore, they don't see any real benefit of it. Therefore, there was no sense of belonging to the last MPA, hence there was no concerted effort to maintain it. (MHD, 45 yr male, Salemo 23 September 2005)

> When those people came here persuading us to join them for some kind of activities, I immediately know, this was just another of that type of project. Those kind of thing only benefit the project holders, who mainly from the city, along with their partners in the village. They only care for the project to be implemented, because that's how they will get the money, but after that they left, and the people in the village knew nothing about all those 'toys' and 'candies' they left behind. (AAM, 40 yr male, Salemo 27 February 2006)

Nearly two years later the village head reported:

> Everything [about the MPA] has gone. The billboards, flags, buoys, and other zone markers, they are all gone. No more MPA. The Village Act is still there, the MPA desk may still also be inside the Village Hall, but the [village-level] MPA working group has stopped working. I don't think people here would still recognize that MPA. (ABD, 50 yr male, village head of Mattirobombang, Pangkep 28 December 2007)

b. Barrang Caddi Island (Site 7)

The classic "prisoner's dilemma" has been played out in the fate of the MPA in Barrang Caddi. One of the village head describes this as follows:

> We used to have this commitment to stop DFP, respect the MPA rules, and allow the fish to populate reefs inside this MPA, and we make that promise in front of our respected leaders. Well, it lasted for – I guess - almost a year, and everyone can see that the reefs were full of many kinds of fish, yet it became too irresistible for some. Once or twice we caught people fishing inside the no-take area, and we prosecuted them. But when an unidentified person blasted the reef, that was just too much to others, everyone felt betrayed, and all of a sudden the commitment was thrown out the window, nobody respected the no-take rule, and that was the end of the MPA as we know it. (HUM, 50 yr male, village head, Barrang Caddi 20 February 2006)

The lost of cooperative trust reflects the particular location and social structure of the island. These two factors come together in the exertion of market pressure for the exploitation of resources:

> We have this problem of being too close to a big city [Makassar]. Quite a few *ponggawa* live in this island, and there's a high traffic of boats from other outer islands travel back and forth to Makassar and pass by here. In other words, the island is very much exposed to fish trading activities and a high diversity of interests which prevented this island community to commit on to a collective action for conservation effort. (DYB, academic and researcher who was among the initiators of the Barrang Caddi MPA, 5 January 2008)

This island is the closest to Makassar and the local *ponggawa* are consumption oriented in their attitudes. The *ponggawa* have many of the attributes of entrepreneurs: pressure from their families for consumption tends to outweigh adherence to the rules of the MPA.

c. Bonetambung Island (Site 8)

When fieldwork was carried out in 2005, the MPA was in its second year and optimism for the future was high. The community leader when interviewed said:

> We are a close knit community here, and may be considered as one big family. In fact everyone here is blood-related and come from one descendant. They all listen to what I say, so it's not really hard to govern. Thus, when this group of university students came here and told me their intention to create a protected seascape, I welcomed them and told my people to help. We appreciate these

> youth eagerness to learn and work with the community, and people here were also keen to learn from them. (DGS, 55 yr male, Bonetambung 21 September 2005)

However, a return visit in 2007 revealed that it had been harder to maintain enthusiasm. The leader explained why:

> The first two years was good, especially the first year. Those students who initiated it also came here quite often. But after a while, maybe their study has finished also, I didn't see them so much around anymore, and people also weren't as enthusiastic as used to be. I guess, the local people don't see much use of it and maybe most of them got bored, so there is no more people goes out patrolling. Beside, some of the MPA's facilities had lost or broken. There is no money to repair them. So yeah... the MPA is still there but no one really pays attention to it anymore. (DGS, 55 yr male, Makassar 30 December 2007)

Bonetambung is a good example of a community with a social structure that should suit the introduction of an MPA. However, given the project-based nature of the initiative, it has proved difficult to maintain local support for an idea that essentially was introduced from the outside. Projects such as this tend not to be sustainable, once the initial movers, in this case a university group from Makassar, have moved on.

The "Open Access" areas

The Open Access Areas are those marine areas in which no particular management regime is being implemented. Although they are actually not entirely unmanaged since local government is responsible for the marine area claimed under its jurisdiction, the attention is generally insufficient to implement effective controls. Three sites were examined and included in this category: (1) the Sembilan Islands region in Sinjai District or Site B ; (2) Tambolongan island in Selayar District or Site C ; and (3) the outer sea area of Makassar city or Site E.

It is predictable that the marine area in this category is generally suffering the impact of destructive fishing practices, such as blast fishing and cyanide fishing. It is in this type of area that such activities take place due to open access and lack of surveillance. The state of coral reefs in Sembilan Island waters is much deteriorated due to DFP. In Makassar, similar conditions exist although the problem is worsened by pollution. In Tambolongan, there are some spots that are left intact having been

spared from DFP. These are mainly close to the island, whereas the further out to sea the more the impact from DFP that can be found.

a. Pulau Sembilan Archipelago (Site 3)

Pulau Sembilan is a group consisting of nine small islands, divided into two sub districts: Pulau-pulau and Lappa. Most of the group is inhabited except for Larearea Island. Environmental conditions and the richness of marine resources are the main factors that influence the livelihood in these islands. For example, they lie on the migration route of certain species such as the flying fish (a type of indo pacific mackerel, *Epinepterus* spp.), which can "jump" up to a hundred meters. The islanders have their own calendar based on such factors and the prevalence of the winds. Much of the fishing is done during the easterly season.

Officially, the fishing practices in this archipelago are described in non-destructive terms (BAPPEDA Sinjai, 2005). Fishermen in Lappa are said to prefer to operate pelagic fishing gears which are dominated by Purse Seine, Pole and Line and Light fishing. On the other hand, fishermen in Pulau-pulau are said to operate demersal and coral reef fish resource exploitation using SCUBA dive equipment, line fishing, lobster pot, and Danish seine.

However, direct observation on the field shows that the fate of the coral reefs at this site is similar if not worse to those in other places. Often they have been reduced to rubble by blast fishing, and this is happening because this is an open access area with no particular management in operation.

b. Tambolongan Island (Site 5)

Tambolongan Island is one among the 117 small islands under administration of the District of Selayar. This site is the second most remote location, after Taka Bonerate MPA, among the nine DFP sites. Because of this the state of the coral reefs is still very good with rich fish resources. But it is also an open access area and attracts fishermen from the neighbouring areas. Being a distant area it can only be exploited by well capitalised operations, which rely on *ponggawa* who take a larger stake in the catch. For this reason the DFP are of medium to large scale.

A conflict between two groups of fishermen erupted on 20 November 2005 which resulted in two deaths and a fishing boat burnt. Police then intervened which caused another death and a few injuries. The two groups were from Nambolaki Island

and Tambolongan, each working with different *ponggawa*. The Tambolongan fishermen attempted to stop those from Nambolaki from blasting the reefs. This is why the boat was burnt. This incident conflict over resources in an area where there is no management of them.

c. Makassar Outer Coasts

This is a fertile area, high in biodiversity, and is a habitat for many types of economically-valued fish. It is, for example, the food migration site for the school of flying fish (*Epinepterus* spp.). Nevertheless, like many other fish-abundant sites in the region, it has been subject to high pressure of human use and is under threat of anthropogenic assaults, such as pollution from domestic sewage from Makassar.

There are eleven small islands in this region, all inhabited and most of the inhabitants are fishermen. They work the fishing resources along with fishermen from Makassar. Because of the closeness to the city, small scale DFP are prevalent here, many being opportunistic “hit and run” in nature. Local fishermen engage in the same practices but attribute them to outsiders. Again this is the consequence of being an open access area.

5.3.2. State of Coral Reefs and Conflict of Interests

Two parameters, derived from field observations and secondary data analysis, are used to present the field sites along gradients or continua representing the spectrum of two conditions. These are the state of the coral reef resources and the perceived resource conflicts occurring at each of the study sites.

The ecological degradation of coral reefs has been understood as the impact of increasing activities of people who bring negative consequences to the ecosystem (Garcia *et al.*, 2003). In addition to economic reasons, social perception and public awareness about the value and function of the ecosystem determine the sustainability of coral resources. From the economic perspective, coral reefs and their associated biotas are very valuable resources that can generate wealth for a community. On the other hand, the fact that many coastal communities are still living in poverty can also be a potential threat to the sustainability of coral reefs.

1. State of the Coral Reef Resources

This parameter refers to the relative quality of coral reef resources, representing a snapshot assessment of the field sites based on a set of ecological and socio-economic variables and sustainability criteria (Table 5.1). The state of coral reef resources is defined as the present ability of the surrounding coral reefs to perform their environmental functions and services, and to fulfil the socio-economic roles assigned to them by local and national stakeholders, and their perceived ability to sustain these roles in the future.

Table 5.1. Variables assessed and considered in the scoring of the State of Coral Reef Resources.

<table>
<tr><th>Ecology</th><th>Socio-economic</th><th>Sustainability</th></tr>
<tr><td>Percentage of life coral cover</td><td>Reef use patterns</td><td>Efficacy of available institutional arrangements for reef resource management</td></tr>
<tr><td>Relative diversity of reef fish</td><td>Local dependency for food harvest from nearby reefs</td><td>Availability of governance organisation and resource management practices</td></tr>
<tr><td>Indicators of over fishing: declining fish catches and fish sizes</td><td>Local livelihood dependency on the reefs</td><td>Current practice of traditional knowledge and practices</td></tr>
<tr><td>Sedimentation and/or erosion</td><td>Market attributes affecting reef use/exploitation</td><td>Level of awareness among locals on the value of coral reefs</td></tr>
<tr><td rowspan="4">Water quality</td><td>Intensity of market pressure</td><td rowspan="4">Attitudes of the local people toward the reefs and related resources</td></tr>
<tr><td>Intensity of DFP</td></tr>
<tr><td>Availability of alternative income generation</td></tr>
<tr><td>Stakeholders’ perceptions about the reefs in their vicinity</td></tr>
</table>

The information has been derived from direct field observation, interviews and discussions with local people, information gained from interviews with experts (scientists, practitioners and activists) and government officials, and secondary data (village statistics, project and research reports).

Figure 5.7 illustrates the results in the form of a continuum. It shows that the state of coral reefs in the study sites ranges from excellent to poor in quality. Sites 9 and 7 are markedly different from the other sites. Scores of 3 and 4 on this gradient show that these sites endure high intensity of fishing, high frequency of DFP, relatively high environmental threats (such as pollution and sedimentation), combined with low awareness of the local people toward conservation. Other sites are mainly within the similar range of "average" quality of coral reefs, with the National Parks generally faring better than the rest. Site 10 especially shows an excellent coral condition, and has been identified by local government as their most strategic asset. The newly established Archipelagic District of Wakatobi has therefore emphasised its strategy to develop the local economy based on this comparative advantage through development of marine tourism.

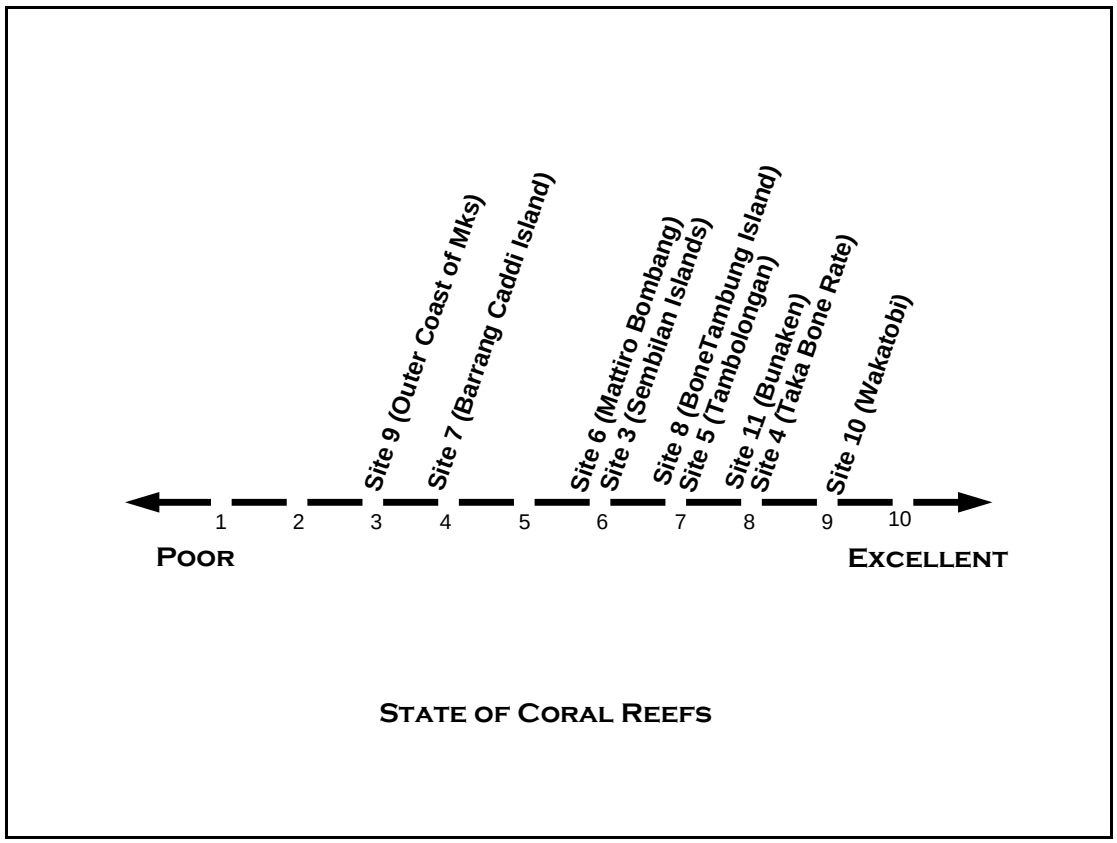

Figure 5.7. A snapshot of the state of coral reefs in the field sites

2. Perceived Conflicts

Perceived level of conflict over resources refers to the potential threats within a community in being able to overcome differences between interested parties (stakeholders) over a shared reef resource. It is essentially a function of the multitude of interests in a particular resource, the intensity of competition between these interests, and the inability of stakeholders to avoid confrontation due to lack of shared values, shared longer-term gains or negotiation mechanisms.

The criteria used to assess the perceived conflict are: number and heterogeneity of stakeholders; number of different interests in reef resources; intensity of market pressures on reef resource harvesting in each area; history of reef resource conflicts in each area; local perceptions of existing and potential conservation efforts (MPA and others); willingness to cooperate and cohesion within the community; and availability of clear norms and effective regulations. These criteria have been used collectively to score sites on a gradient as illustrated in Table 5.2.

Table 5.2. Gradients used to interpret the spectrum of perceived conflict which existed in the study sites.

Gradient	Perceived Resource Conflict
1	No conflict, a resource-secure and cohesive community
2	Highly cooperative
3	Supportive
4	Accommodating
5	Indifferent
6	Resistance, some potential for conflict within the community
7	Resentment, large potential for conflict in the community
8	Provocative
9	Physical confrontation – resulting in injury or physical abuse
10	Lethal conflict – conflict resulting in death among those involved

Figure 5.8 illustrate the results in the form of another continuum. It shows that the state of perceived conflict of interests in the study sites ranges from low to very high. Sites 8 and 11 have relatively lower potential of conflict for quite different reasons. Site 8 has a close-knitted population of 70 which makes it quite homogenous and much easier to manage, whereas Site 11 is located 10 miles from Manado, a city of half-million population. However, Site 11 is a National Park with relatively well established institutions and therefore manages to reduce potential conflict effectively.

On the other hand, Sites 3, 9 and 5 are open access marine areas with very little institutional means of managing access into the area, and therefore subject to multi-use multi-stakeholder interests which subsequently lead to increased potential in conflict. Tambolongan (Site 5) scores most highly on this continuum because of the conflict that occurred here in 2005.

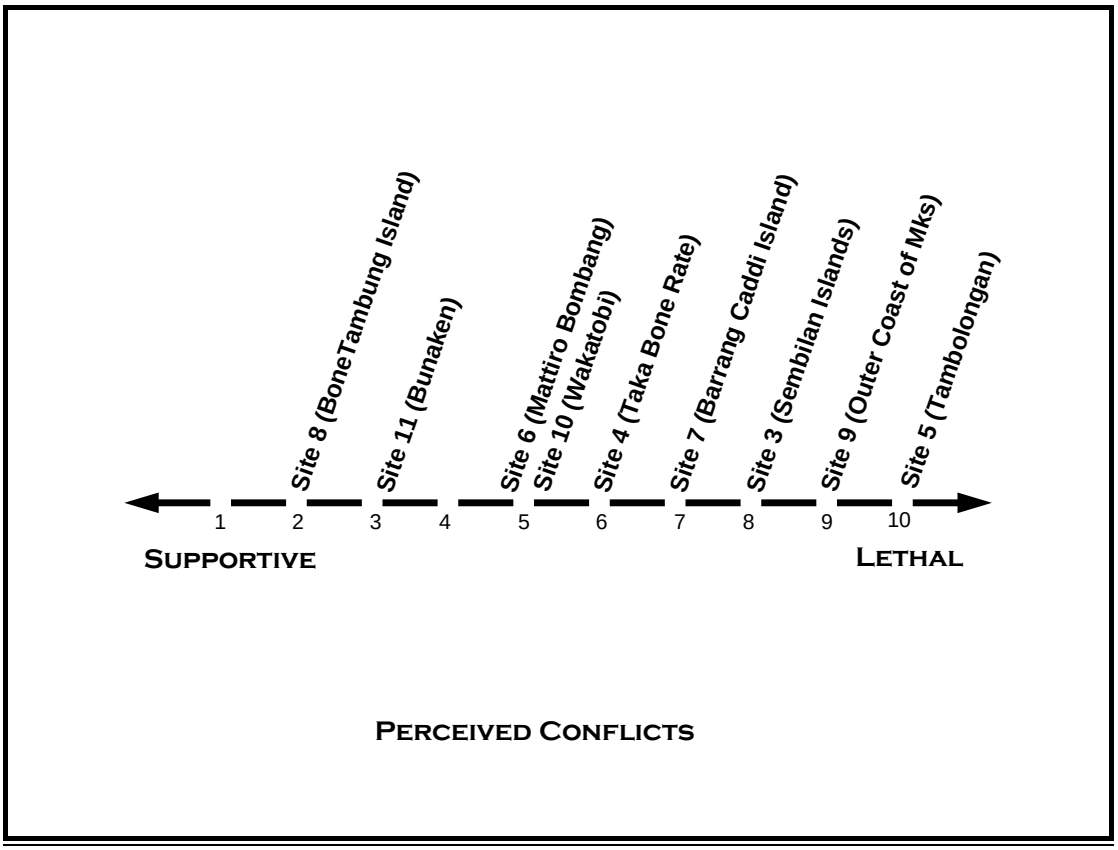

Figure 5.8. A snapshot of the state of perceived conflict from the field sites

3. A Matrix Between the State of Coral Reefs and Perceived Conflict

Figure 5.9 reveals the relation between the level of perceived conflict and the state of coral reefs in all nine study sites. It groups them into the three categories of National Parks, locally initiated MPAs, and Open Access. The matrix in this graph was generated by combining the results from the two continua illustrated in Figures 5.5 and 5.6. The result is a graphic depicting the relation between the perceived conflict and the state of the coral reefs in each of the study sites.

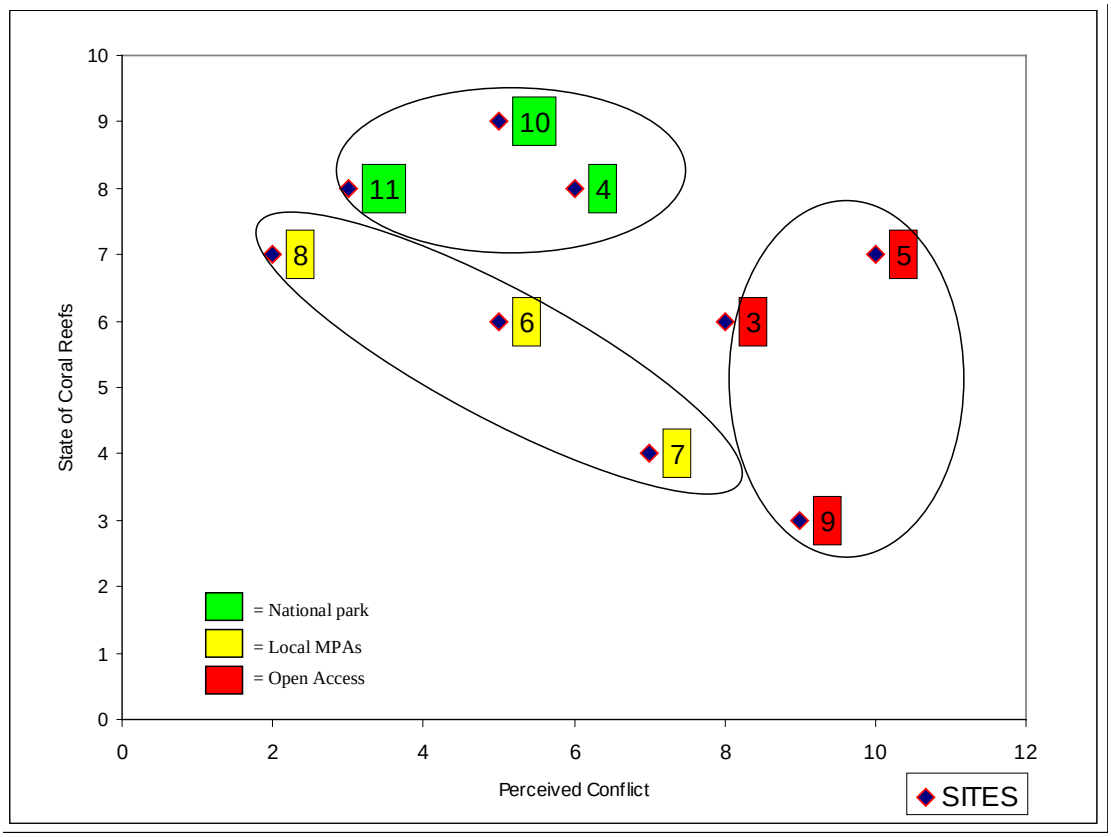

Figure 5.9. A matrix between the indices of Perceived Conflict against the State of Coral Reefs, showing how the three sites in each category can be identified as sharing similar features. (Source: field data)

Three patterns are apparent from this matrix. These are firstly, open access areas suffer more conflict relative to other site categories; secondly, that despite many limitations and shortage in facilities, national parks manage to maintain the quality of their coral reefs relatively better than other site categories; and thirdly, that the locally initiated MPAs show a varied level of success. These levels of success are consistent with the perceived conflict occurring in each of the sites.

Further analysis of these results implies three important findings that can be drawn further from this particular part of this research. Firstly, conflicts of interest do have an impact on the state of local coral reefs (e.g. sites 7 and 9). Secondly, institutions are important: these reduce the potential for different interests to come into conflict, and facilitate capacity building for communities to work together and building trust (e.g. sites 8, 11, 10 and 4). Thirdly, locations with good access to fish trading suffer more DFP in comparison to other sites that are relatively isolated from market activities (e.g. sites 7 and 9). These findings are in agreement with Agrawal's

synthesis of enabling conditions for sustainable management of CPR as presented in Table 3.4.

The third point from these findings can be more fully understood by looking at Figure 5.10 below. It provides a comparison between sites 7, 8, 9 and 11. Each of these sites is located relatively close to big cities. Site 7 (Barrang Caddi Island), 8 (Bone Tambung Island) and 9 (Outer Coast of Makassar) are all within the administrative region of Makassar, a city with a population of 1.3 million. Site 11 (Bunaken) is approximately 10 miles from the shore of Manado, a city of half a million people. Given their proximity to big cities where mainland *ponggawa* are usually located, these four sites could be expected to have similar market pressures on their coastal, especially fishing, resources.

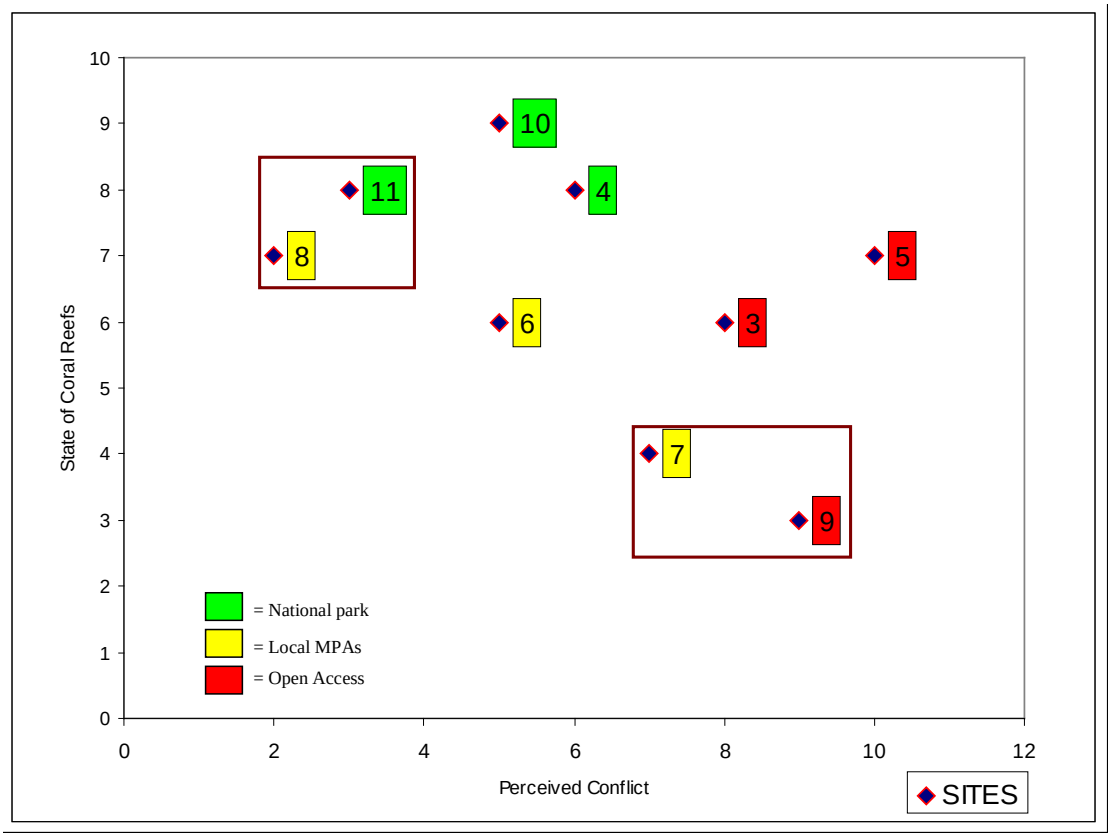

Figure 5.10. Further interpretation of the matrix between the indexes of Perceived Conflict against the State of Coral Reefs. Sites inside the boxes are within close proximity to big cities but perform differently due to their role in fish trading. (Source: field data)

With the exception of Sites 10 and 4, which are located far from a city, Sites 8 and 11 are more successful in maintaining the quality of their coral reefs in

comparison to other sites, especially Sites 7 and 9 which have similar proximity to the city. Figure 5.10 clearly reveals that the different state of coral reefs between Sites 8 and 11 on one hand, and the Site 7 and 9 on the other, is due to the difference in their state of conflict of interest over their coral reef resources. Sites 7 and 9 are more prone to conflict and therefore suffer more problems in maintaining the quality of the local reefs as a direct result of DFP.

In other words, the role that a particular site plays in the fish market is more important then its mere location. Sites 8 and 11 do not have *ponggawa*; site 11 is a national park and site 8 is a small island. Therefore, despite their proximity to large cities they are relatively poorly integrated into the market network. Those sites where *ponggawa* live are much more exposed to a collusive network of interests controlling DFP.

5.4. THE COLLUSIVE NETWORK THAT RUNS THE DFP

When an outsider visits a coastal community in Indonesia, specifically within the Sulawesi region, and asks local people to identify who has destroyed the nearby reefs, the enquirer will most likely be met with a suspicious look and unhelpful answer. No one in the community is likely to feel comfortable discussing such an issue without first identifying and knowing exactly to whom they are speaking. The issue of DFP is a well known topic to everyone in coastal communities, yet it is treated like a taboo subject to discuss with an outsider. The fact that it is treated in this way indicates that such an issue is potentially dangerous and should not be discussed openly. The most common response to such premature questions would go along the following line, as these two quotes reflect:

> It must be done by people from outside, fishermen from our community here don't do such a thing. (MAR, male 35 yr, Barrang Caddi, 29 October 2005).

> We often heard such blasting sounds reached here. But it's really hard to identify them. Even if we go out to the reef chasing them, they would have been gone by the time we got there. (BST, male 40 yr, Taka Bonerate, 5 November 2005)

Comments like above are typical when there has been no particular relation established, no trust has been built, and since this is a potentially sensitive and dividing issue, local people tend to avoid discussing this with individuals they are yet to know better. My earlier experience proved to be unfruitful when no trust had been established. However, once trust and good rapport were built, and the community accepted you around them, then people feel more comfortable to talk. In fact, these local people are eager to share what they know and expect that the person they talked to may eventually offer some solution. To some extent, local people were frustrated, felt powerless, and therefore were becoming apathetic toward the issue of DFP.

After spending more time in the field, building good rapport and doing investigations, it finally occurred that fishermen who are involved in DFP have different types of activities, work schedules, and even lifestyles. In general, fishermen's routines are dictated by two things: the types of their target fish and the gear used to catch them. These things further determine their selection of fishing grounds and the time spent fishing. Given that the target fish and methods/gear used to catch them define the routines of the fishermen involved, such differentiation is further reflected in the boats fishermen use for their operations. Not only are DFP gears different to other non-DFP fishing methods, but blast fishing and poison fishing apply different instruments too. Although both types of operation may use similar type of boats, and the boats will likely to bring hookah compressors to help provide breathing air supply to their diving *sawi*s, they are targeting different fish for different market, and applying different methods. In other words, a specific operation needs specific supply of gear and materials. Thus basically, DFP operators can be identified relatively easy, simply by understanding the fishermen's routines. Unlike in other types of underground activities, the local community, especially neighbours and next doors, actually do know who are the DFP operators among them.

In Barrang Caddi Island for example, the fishing community can be categorised into three groups: (a) gill net fishermen who are targeting actively swimming near-bottom fish, (b) hook and line fishermen who are targeting pelagic fish such as skipjack tuna, and (c) poison fishing which targets the reef fish. However the gill net fishermen in Barrang Caddi are a minority, and most of the fishermen either use hook and line or perform poison fishing.

The gill net fishermen generally leave very early morning, around 3 am, to set up their net in a location which is usually within the vicinity of the island. They arrive

back around 6 am, then get involved in other household chores, and go out to check their net around 11 am. Upon deciding that they have got sufficient catch for the day, they are usually back at home by 2 pm. If the catch is not good, they may decide to set up the net again and prolong their fishing until almost sunset or around 5 to 6 pm.

The other two groups of fishermen normally leave for fishing just after sunrise (6 to 7 am) and come back late afternoon or early evening. The poison-fishing practitioners usually reach their home in mid afternoon around 2 to 3 pm, whereas the hook and line fishermen arrive mostly after the sunset (6 to 7 pm). The shorter working hours for poison fishermen may reflect the "effectiveness" of this method in collecting fish.

Nevertheless, observation in the field also suggested that the fishermen needed to bring their catch quickly to the collector who will then pack and dispatch the live fish immediately to the airport. Their operation time therefore may also be adjusted to suit the cargo timetable scheduled to fly their catches. Unlike blast fishing, this is especially important in poison-fishing activities where fish has to be kept alive when reaching their customers, and their freshness defines the price. The following comment is from a businessman who deals with exporting live-reef fish from Makassar. This respondent has been sending fish routinely through the route of Makassar–Bali–Singapore or through Makassar–Bali–Hong Kong.

> Our role is very important here. In this business time is everything. Fish like Napoleon wrasse [*Ceilinus undulatus*] for example, may fetch USD100 per kg only when they arrive alive and fresh. After spending a few days in the aquarium, they may look dull and they couldn't reach premium price anymore. Once the fish die, they are worthless. The money is in their freshness. That's why, you've got to move fast in this business. My [business] partner overseas told me, they want "morning catches in Makassar for tonight's dinner in Hong Kong" (BAM, exporter in Makassar, 29 September 2005)

The existence of the middlemen is quite often controversial. Many suggest that middlemen extend the marketing chain unnecessarily and make it inefficient (e.g. Sallatang, 1983; Dahuri et al, 1996; and Yusran, 2002). On the other hand, the middlemen themselves have always defended their existence by emphasising the importance of their role. In many cases, their roles are indeed crucial. Although these middlemen extend the fish trading chain and make it more complex, they are very mobile and well equipped – with faster boats and cool box facilities. They are therefore playing a significant role in accelerating the movement of the commodity to

market. Their involvement in the trading chain increases the price for which the fish can be sold because they are able to access a wider market. The following is another comment from a middleman, this time from the one that deals with dynamite fishing products.

> Time is a crucial factor in marketing the fish. We need to get the fish as quickly as possible into the market. That's why we operate cool box fleets specially designed to meet the fishermen on the open sea, to pickup their freshly caught fish and bring them immediately to the fish auction market. This way helps to accelerate fish reaching the market, and especially to get a better price (DSG, trader/middleman, Pulau Sembilan, 9 December 2005).

The previous Figures 5.2 and 5.3 confirm the significant role these middlemen play in this business. Furthermore, the extensive occurrence of middlemen indicates at least two things. First, that the business is very attractive, with relatively inexhaustive markets and easily available fish supply. And second, this is a very dynamic business, where it involves aggressive expansion. Both of these however, also indicate that the resources are being exploited intensively, mostly as an open access regime, which clearly are on a direction to a situation of "tragedy of the commons"[3].

An important goal of this case study is to unravel the reason behind the persistence of DFP in Indonesia, especially in Sulawesi region where it has been indicated to be the region where it occurred most (COREMAP, 2004). Findings from the field suggest that there is a set of complex interests being played out behind the operation. Superficially, there does not seem to be much organisation in these activities, as this reflected in the following comment from a local police officer:

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[3] The term "tragedy of the commons" refers to a dilemma described by Hardin in his seminal article in 1968. The article describes a dilemma in which multiple individuals acting independently and solely and rationally consulting their own self-interest will ultimately destroy a shared limited resource even when it is clear that it is not in anyone's long term interest for this to happen.

This parable was further embraced as a principle by then the emerging environmental movement. However, two decades later, many research and empirical data shown the inaccuracy of this term. These studies, most notably by Ostrom and colleagues eventually refute this abstract concept with the real life experience from places like Nepal, Kenya, Indonesia and many other places. Ostrom *et al.* (1993) show that when local users of a common pool resource have a long-term perspective, they are more likely to monitor each other's use of the resource and developing rules for behaviour.

Garrett Hardin himself later revised his own view, noting that what he described was actually the Tragedy of the Unmanaged Commons. The tragedy is not due to the commons, but to reckless and selfish overuse of the commons-- the tragedy of the unmanaged commons, as Hardin later put it.

Source: (Hardin, 1968; Ostrom *et al.*, 1993).

> The reason that such an activity cannot stop is because too many people are doing it. These are non-organised individual fishers who perform the 'hit and run' method. It's really hard to cope with them. You sweep them here today, somebody else will do it somewhere else tomorrow. I am afraid there's just no end to it. (BMB, police officer, Makassar, 30 Sept 2005).

It was not entirely clear if this respondent really understands the fishing operations in this way, or was frustrated that in doing what his job allows, little was being achieved. The reason why such operations persistently recur is in fact because they are very well organised, they operate in the form of a collusive network which resembles the Patron-Client mode of relationship. The patrons or *ponggawa* are people of good social and economic status whose role in the DFP system is invisible but nonetheless crucial in providing capital, fishing gear and security. The *ponggawa* in other words play roles at different levels.

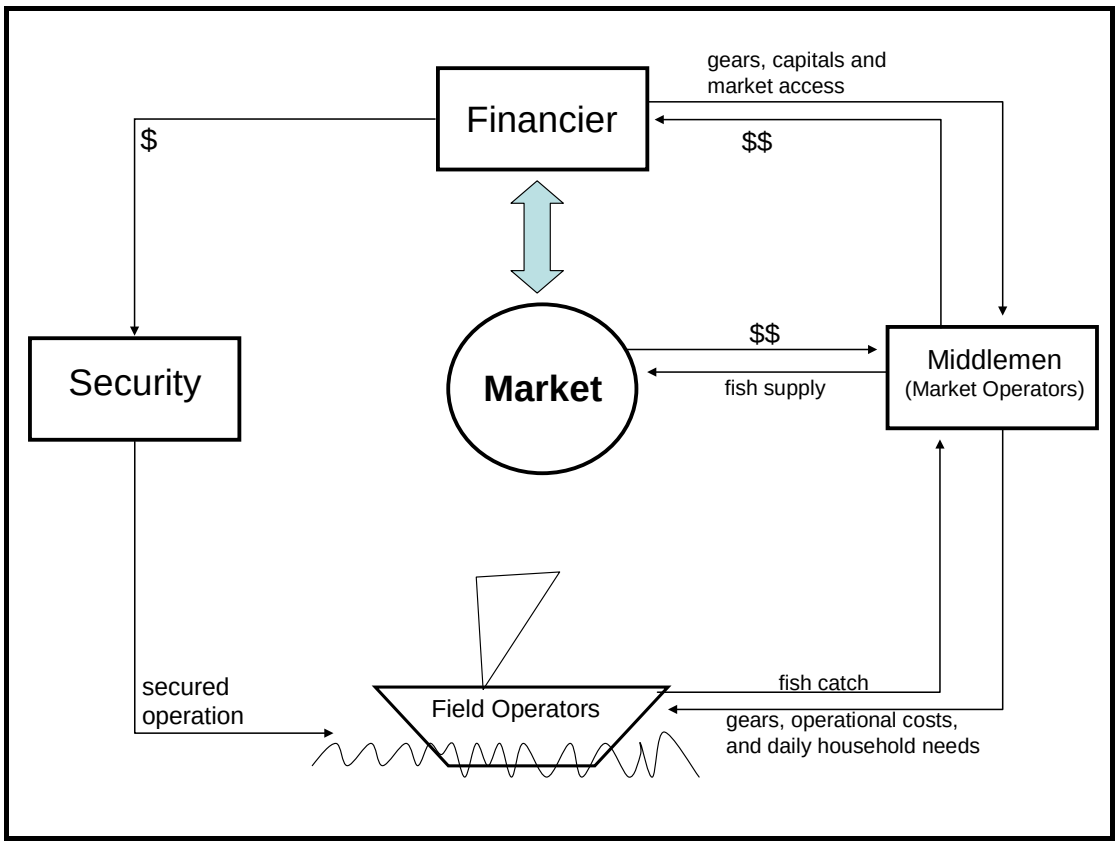


Figure 5.11. A diagram to depict the role of each actor involved and the relationships between them in the Collusive Network which runs and controls destructive fishing operations.

Figure 5.11 depicts the key elements that constitute what might be called a DFP networking model. Four categories of typical actors and roles are identified, along with the relationships between them. The financier will be a *ponggawa*; the middleman maybe a *ponggawa*; and smaller *ponggawa* can lead a fishing operation on a boat. In general, there are two categories of DFP actors: the direct and indirect actors. The direct actors are those who play visible roles; the indirect actors are those behind the scenes. The direct actors have been described in section 5.2. This section will therefore deal with people involved in the network, often indirectly and subtly, yet whose role is vital for DFP operations to take place.

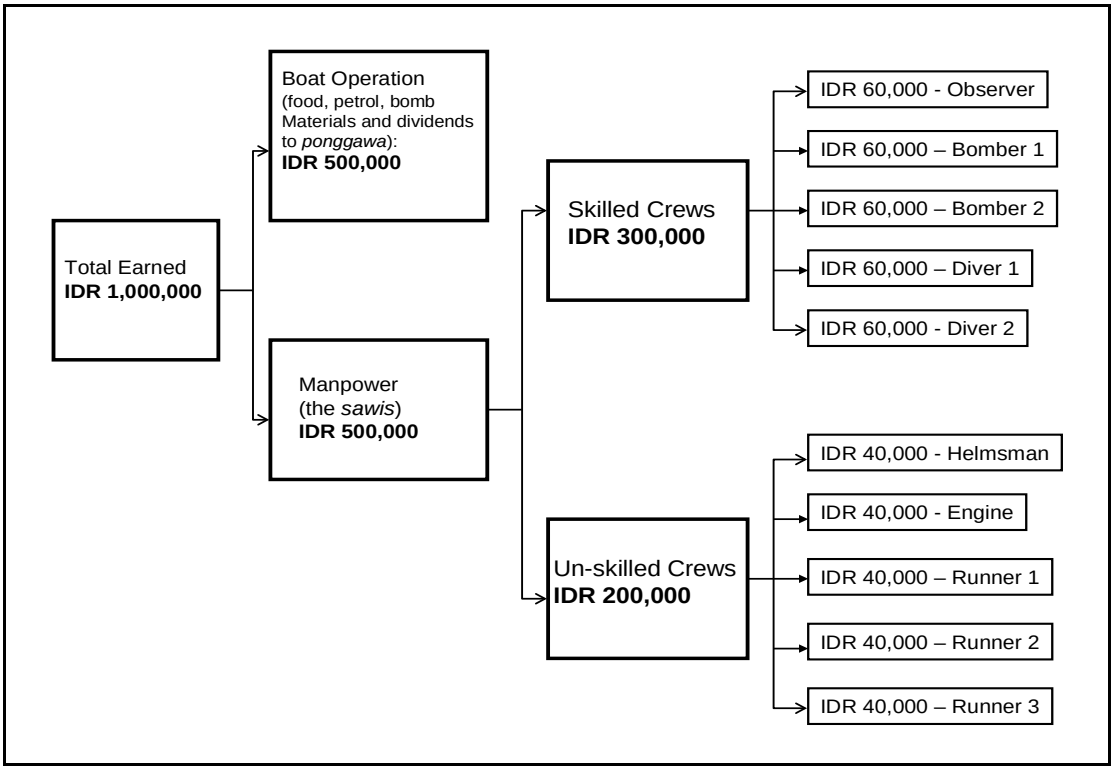


Figure 5.12. General model of revenue distribution within a medium scale operation of a blast fishing group. Bigger scale operations may allocate higher percentages for the manpower, whereas smaller scale operations may need to allocate higher percentages for boat operation. IDR stands for Indonesian Rupiah. During the time of field work, the currency rate was approximately IDR 10,000 to USD 1, or around IDR 6,500 to NZD 1.

There is a complex relation between the *sawi*, the workers, and their *ponggawa*. In Figure 5.12 the *sawi* are illustrated as the manpower providing the skilled and unskilled crews. This figure illustrates in a notional way the division of revenue between labour (*sawi*) and capital (including boat operation cost and

dividends to *ponggawa*). The general structure of this figure is derived from field interviews to illustrate how fishing operations work. The division of revenue that it shows is based on a general sense of how revenue is distributed.

Despite of the common criticism (e.g. Sallatang, 1983; Mantjoro, 1996; Streich, 2001; and Yusran, 2002) that *ponggawa* exploit their *sawi*, their relationship is in fact far more complex. The following quote shows that it is in the interest of *ponggawa* to develop social relationship with the *sawi*, in order to ensure the loyalty of their labour.

> What does the government know about fishermen's problems? All those talks about providing money through BRI [a state owned bank] or KUD [the village-level fishermen cooperative] are just lip service. The simple fact is that when a fisherman is in urgent need of money where do you think he will go to ask for help? BRI? Cooperatives? Of course not! Do you think a BRI banker will open his door when a fisherman knocks at midnight asking to borrow money to bring his child to hospital? Not a chance! On the other hand, a *ponggawa* in addition to lending his *sawi* the money, would offer his boat to use to bring the sick child to hospital on the mainland. (KHR, 55 yr male, Makassar, 12 September 2005)

Government criticism that *ponggawa* are merely exploitative are not understood in the villages when neither government nor the banks are able to provide the support that *ponggawa* can. The following quote shows the strength of relationship that *sawi* often have with their *ponggawa*:

> I consider myself lucky to work for this boat. I know people come and go, but I'm grateful to have been with this boat for more than a year. I owe it to Mr. HMS [the boat owner] for me being able to feed my wife and kids. It's not easy to find a regular job nowadays, especially for a person like me who has no schooling [background]. As long as there is something for my family to eat, what else do I need? (SHR, 30 yr male, Pulau Sembilan, 5 November 2005)

In addition to the *sawi* and *ponggawa*, there are an important set of indirect actors. These cover such roles as: harvest buyer, gears and materials provider, financial provider, security provider. The security providers are government operatives. They are general police responsible for enforcing the law including fisheries regulations. But they face huge problems. The head of Air and Sea Patrol in Makassar said somewhat apologetically:

> From time to time we send patrol teams out. But the [sea] area to cover is so large that is incomparable to the limited personnels and facilities we have, not

> to mention the very small budget allocated to our institution to do such a huge job. (NSS, Makassar police precinct, 29 October 2005).

In addition however, the *ponggawa* need to reach an accommodation with the security providers. Such accommodations are usually reached person by person and place by place. It would seem that they are not institutionalised, but nonetheless are important for the operation of each party's roles:

> Although we had an agreement, we need to respect each other positions. I had to promise them not to do it again, at least not within their patrol area and time, because they need to maintain this image of doing their job properly. (HTH, 50 yr male, *ponggawa* in Barrang Caddi, 20 February 2006)

This quote reveals the extent of the behind the scenes network that compounds the difficulties of the security operatives. The next quote is from a *ponggawa* who shows the way in which accommodations are reached.

> This is my calculation. My boat got caught and my *sawi* (workers) were thrown in jail. For every day my boat doesn't operate I lost money, and while those *sawi* are in jail who will feed their family? Most likely they will just borrow money again from me. So I talk to their boss, we negotiated, and I paid. So in the end, I got my boat back, the *sawi* back to work, and they've got some additional pocket money. Everybody is happy, right? (DNS, 43 yr male, *ponggawa* in Makassar 29 October 2005)

These collusive interests have succeeded in two things. Firstly, they have taken advantage of the difficulties of law enforcement over such a wide areas of coastline in sea, as well as of weak formal institutional capacity. Secondly, they have taken the traditional patron-client mode of relationship in Sulawesi and turned it to their advantage in order to build fishing enterprises. The following comment from one of my respondents who was an NGO activist and has spent almost ten years on the field working in island communities for many community empowerment projects summed up very well his observation about the DFP.

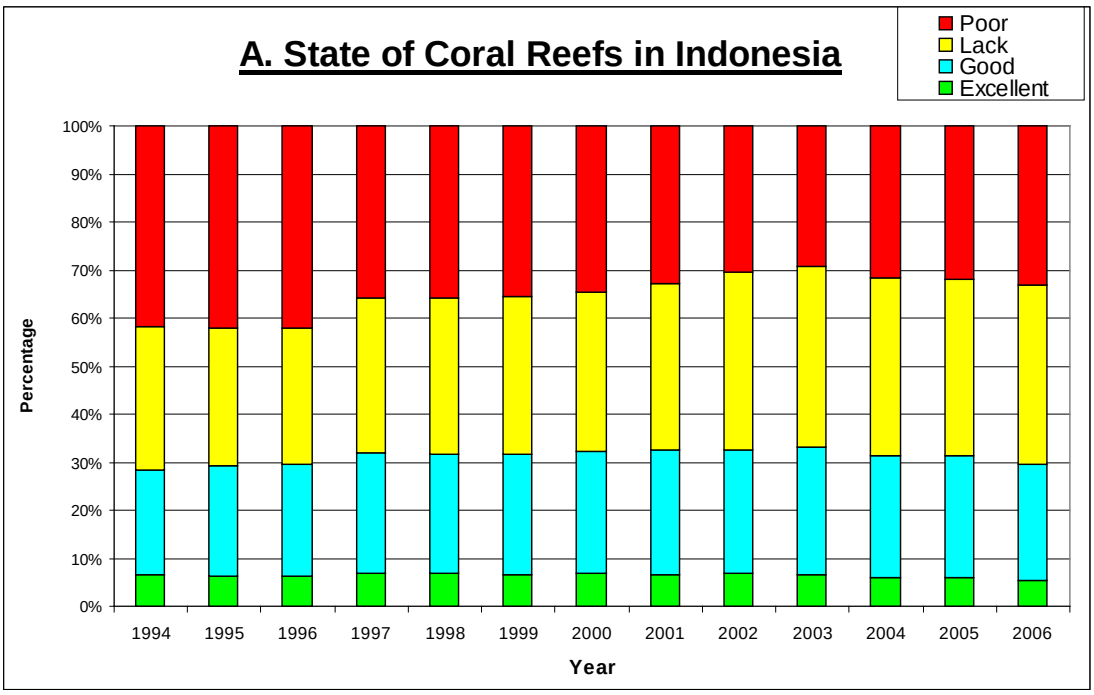
> The trickiest, and therefore the most persistent, problem I think is that behind these poor destructive fishermen in the field there is a well-structured behind-the scene network operating to take advantage of the situation. There are material suppliers [for bombs and poisons], security back-ups, fish collectors, fish marketers, fish exporters, and all the way to fish importers in other countries. And I suspect, the further it is from the field, the more money is made. (ASD, environmental NGO activist, Makassar, 11 February 2006).

5.5. THE PERSISTENCE OF DFP AND THE PROSPECT FOR SUSTAINABLE COASTAL LIVELIHOODS

The dynamic of DFP in Indonesia represents an interesting case of the tragedy of the commons. It is therefore appropriate that this study explores DFP issues through the perspective of the discourse of the commons. Indonesia is richly endowed with marine natural resources, and its people are highly dependent upon them for food, coastline protection, and other ecosystem functions. Despite this strong dependence and the availability of the legal framework to protect them, DFP continues to pose some of the greatest threats to the sustainability of Indonesia's marine ecosystems, particularly its coral reefs.

The challenge of establishing and maintaining a system for protection and sustainable use of the coral reefs in Indonesia is a formidable one. The communities at the study sites are dependent on fisheries, especially on the reef fishery. In all cases, more than half, but ranging up to 90 %, of the working population is fishermen. The dominance of fishing defines the different aspects of life in the communities including economic, ecological, social and institutional issues.

Figure 5.13 shows the results of coral reef conservation efforts to date in Indonesia. These include the World Bank loan funded project of COREMAP which has run from 1998 and is expected to last until 2014. The graph shows that the effort has succeeded in reducing the extent of coral reef in the category of “poor” from 43% in 1994 to around 35% in 2006. This data is based on repeated reassessment of the state of reefs at set sites. Nevertheless, the extent of coral reefs in the “good” and “excellent” categories has not increased significantly. After 12 years of effort, this rose only from 28% in 1994 to 30%. In fact, the extent of the “excellent” state amongst coral reefs has actually reduced, albeit very slightly, from 7.2% in 1994 to 6.8% in 2006. The picture is similar for Central Indonesia which include Sulawesi Island. The decade long effort only managed to slightly reduce the “poor” state of coral but did not increase those in “good” or “excellent” category.



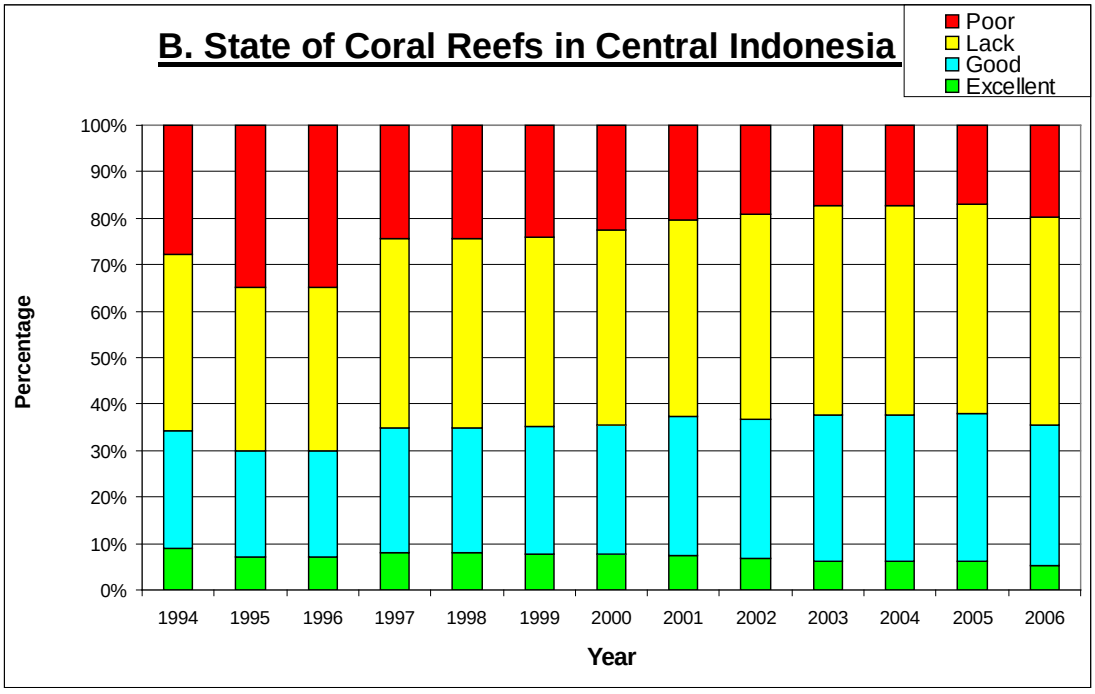


Figure 5.13. State of Coral Reefs in Indonesia from 1994 to 2006. A) National average, B) Average data from sites within Central part of Indonesia where Sulawesi Island resides. (Source: Compiled data from COREMAP 2003 and COREMAP, 2007).

The important driving force behind the coral reef destruction is the activities of the collusive networks operating DFP. Short-term but large economic profits go to selected individuals, including the *ponggawa* and their *sawi*. However, the resulting destruction to the physical structures of reef habitats and the biodiversity of this environment are devastating. Those fishermen who use such destructive practices as well as others whose catch or harvest of marine biota exceeds the biologically sustainable level are not being required to pay the cost of the damages which they cause or be directly responsible for repairing the damages. Instead, the cost must be borne by the rest of society. In economic terms, a negative externality exists due to the misappropriation of those coral resources (Pet-Soede *et al*., 1999), and the case in Indonesian coral reefs has been illustrated in further quantitative details by Cesar *et al.* (1997). This problem of externality needs to be solved in order for the DFP affecting coral reefs to stop. The question is how can this problem be solved?

Different actors in the network participate in DFP for different reasons. For many *sawi* the inducement of the opportunity is to escape the effects of poverty. However many of the middlemen and *ponggawa* are more concerned with wealth creation and reaping the excess profits to be had in fish export. Discussion and evidence from the field suggested that poverty induced destructive fishing could be solved relatively easy through effective law enforcement at the local level. Such possibility has also been suggested by, *inter alia*, Cesar et al. (1997), Pet-Soede *et al*. (1999), and Prasetiamartati (2007). On the other hand, the destructive fishing induced by global market-pressure is a problem at a different level. The solution has to be not a straightforward implementation of local strategy, but needs to be at a higher level.

The attitude of fishermen toward the reefs defines the possibility for future sustainable use of this resource. Some comments from field interviews show the attitude of the fishermen toward reef conservation and how they represent the impact of their action. Even when they know the interviewer well, they downplay the effects, and often compare their actions with others they perceive as being worse offenders. These comparisons are often with well known cases of corruption outside of the fishing industry.

> You should note that our targets [in blasting] are the fish. So, we don't go around blasting the reefs, which is just not our intention. (ABD, 50 yr male, Barranglompo Island, 26 January 2005)

> We only squeeze very little amount of this [poison] to the fish, just to make them 'drunk'. I don't think it does any harm to the environment. It's a very tiny amount compare to the massive amount of sea water to dilute the effect. I don't want to use too much either, because it is quite expensive, and [if overdose] you may kill the fish too. That's not what we want. (SDM, 25 yr male, Barrang Caddi, 20 February 2006)

> You guys [the conservationists] are being paranoid. Look it, the amount of [potassium] cyanide we put into the sea is really very small compared to other [type of] pollution that end up in the sea. What about those chemicals from industries and all other domestic sewages, they all go to the sea? Those are the real pollution that you should worry. (RMN, 35 yr male, Manado 7 October 2005)

Individual resource users tend to take benefits from resources at the present time, and consequently care less for the future. Ostrom (2005) tried to explain this by pointing out that individuals attribute less value to benefits that they expect to receive in the distant future, and more value to those expected in the immediate future. This means that fishermen discount future benefits (see also Ostrom, 1990). When users perceive a low discount rate, they will likely manage resource for long-term benefit. Conversely, when it is high, users have normally less consideration for future benefit. The present research, in explaining the nature of the collusive network behind the discounting regime adds a degree of sophistication absent in Ostrom's earlier analysis.

Fisheries sustainability has been a long contested subject and many studies have been conducted in this area (FAO, 1995; Garcia and Charles, 2008). They reach a range of conclusions, from the pessimistic ones to the more optimistic. On the one hand, marine fisheries has been termed a "sunset industry" (Garcia *et al*., 2003) reflecting a grim future, especially for the marine based industry to the more optimistic hopes that rely on the ability of local communities to maintain their fish stocks (Hildebrand, 1997; Christie *et al*., 2005; Ronnback, 2002). A common thread in all of these studies is that fishing has inescapable ecosystem impacts. The question of sustainability is a matter of how much perturbation is tolerable in the ecosystem. In addition, it should also be kept in mind that efforts to alleviate pressures from one set of issues may eventually increase pressure on other factors that affect sustainability.

In addition to the above considerations, another important matter to add is the fact that formal institutions to support coastal resource management in Indonesia have not been functioning optimally. There is an apparent lack in the efficiency of work of

formal institutions, as admitted by this one former senior official in the Department of Ocean and Fisheries of Indonesia:

> In most cases, the government institutions, be it the personnels or the system in place, just don't work efficiently. Our legislative frameworks are either insufficient or insufficiently enforced. For example, the issue of property rights on most of our natural resources is still unsettled, for many –but mainly political- reasons. The corruption level within these institutions is staggering, very much on the opposite of the awareness among bureaucrats and elected officials over the environmental issues. Furthermore, our research capacity is very weak. All these factors must be addressed in order to have an effective strategy toward sustainability. (Prof RD, former Minister of Marine Affairs and Fisheries, Jakarta, 6 Feb 2006).

This study is concerned with the sustainability of coastal resources. One area of investigation was to identify the factors that were promoting unsustainable behaviours in resource use. Seven factors are identified from the analysis in this chapter as the reasons behind the application of DFP. To mention briefly, these are: the interest of the "collusive network" as discussed in previous section; inappropriate incentives, which tend to favour short-term gains instead of long-term sustainable uses; competing demands amongst the stakeholders for limited resources; poverty and lack of alternatives in coastal communities; inadequate knowledge among the stakeholders; lack of effective governance; and the problems of externalities. These factors will be analysed in the synthesis chapter (Chapter 7) and possible resolutions to the problems they create is addressed further in the conceptualisation chapter (Chapter 8).

5.6. CONCLUSIONS

Coral reefs are precious resources that enhance Indonesia's claim as one of the world "hotspots" of biodiversity, also known as *megabiodiversity*. Coral reefs are very important coastal ecosystems in tropical areas, and they constitute the core of the livelihood in most, if not all, Indonesian coastal communities. However, the quality of these resources has been declining quite rapidly within the last twenty years due to human-induced deterioration. One of the most significant anthropogenic threats to the sustainability of coral reefs in Indonesia is the use of destructive methods in catching fish which in this study are identified as DFP.

Fieldwork for this case study, conducted in nine sites within the Sulawesi island region, reveals that the rampant and widespread practices of destructive fishing are generally fuelled by two important factors: a) internal forces, in this case poverty in coastal communities, especially among the fishermen, and b) external forces, in this case the pressure of market demand upon reef fish commodities. The relatively unsaturated market for reef fish in upmarket restaurants in the booming cities of Asia, such as Hong Kong and Singapore, induces high demand for coral fish. In turn this stimulates fishermen, and those for whom they work, to increase catches as much as possible, through any possible means, barring any consideration of conservation measures.

Figures from the field suggest that up to 70% of reef fish catches from this region were caught through DFP, and between one-third to half of coastal fishermen in the region was or has been using DFP to catch reef fishes. There are two types of DFP commonly applied: blast fishing and fishing with cyanide. Blast fishing is mainly for direct consumption and therefore almost all catches are consumed in the domestic market, whereas cyanide fishing is directed more for export markets where live reef fish products fetch a much higher price. Respondents in this study cited “easy, yet effective” as the main reason for their application. Nevertheless, these practices kill coral reefs, kill untargeted fish, and are harmful to the fishing communities themselves. Lack of awareness within the community about the effect of DFP has on the ecological functioning of coral reefs has been a factor responsible for proliferation of this method. Studies have shown that DFP have tremendous impacts on fish stocks. The dwindling numbers of population from certain species –mainly the high-valued biota, such as giant clam, sea-cucumber, and other coral fishes, will jeopardize the economy of local communities.

Findings from this study reveal that institutions indeed shape the extent of DFP. This further reinforces the analytical perspective proposed by Ostrom *et al*. (1993) on the role of institutional incentives to achieve sustainability. Two assessment parameters were employed to compare the nine sites in terms of the dynamic of DFP in this area. These are the State of the Coral Reefs and the Perceivable Conflicts of each site. The matrix between these two parameters produced an interesting assessment showing that regardless of species diversity and quality of their coral reefs, Open Access sites have generally high levels of perceived conflicts. Furthermore, regardless of the many impediments in managing National Parks, the three National

Park sites in the study consistently fare better in terms of the quality of their coral reefs. On the other hand, the Locally-initiated MPA sites showed a range of success, depending on the effectiveness of their institutions. This particular result suggests that the availability of institution arrangements to implement conservation effort is important. The effectiveness of such arrangements, however, determines whether the objective is attainable and the results are sustainable.

It was further observed that research sites that are more accessible to the trading network are more susceptible to increased perceived conflicts and have more problems supporting conservation efforts. The lack of alternative income generation methods available to small island communities is partly responsible for increased pressures over locally available coral reef resources. The fact that many coral reef sites are remotely located and an apparent weakness in monitoring them through surveillance efforts have added into the complexity of this problem.

Another question discussed in this study is the reason for persistence of destructive fishing practices in this region. Again, institutions are part of the problem, as well as the answer to this persistence. Weak and inconsistent law enforcement has been the reason for the government inability to uphold the law to punish violators and to effectively eliminate DFP. A significant stumbling block is the widespread practices of corruption in certain levels of resource governance of the country. Evidence from the field suggests that various law enforcement efforts have actually been turned into “cash cow” situations, where field officers exercise their discretionary power to negotiate violators. Further than this though, involvement of security officers in providing a safe haven for DFP operations was a feature consistently indicated by respondents.

While it is true that the tendency of certain individuals to operate destructive fishing methods has been motivated by short-term gain to reap economic benefit without any considerations for future sustainability, this study further finds that DFP is not a stand alone or one party operation. Instead, it is methodically planned and executed, well financed, and involves several layers of parties or actors. Indeed, the reason for resistance to overcoming DFP is because it is an “institutionalised” practice. DFP is run by a collusive network of interested parties, or stakeholders, who are taking advantage of the inefficiency of institutional arrangements in managing Indonesia’s marine resources.

This study identifies four types of actor who operate together in creating a collusive network, namely: the field operators, middlemen, security providers and financiers. These actors assume important economic as well as social roles in their local coastal community, and their economic interests are embedded within the community. In fact, as the field evidence indicates, this collusive network has actually succeeded in getting a "free ride" over the established system of *Ponggawa-Sawi,* a traditional patron-client relationship that has shaped the local marine resource system. Such intricacies of influence and involvement have made the straightforward, traditional ways of dealing with this issue fraught with failures and frustration, and this is the real reason behind the persistence of the DFP. Therefore, alleviation of DFP problems must address the existence of this collusive network that runs and controls marine activities.

CHAPTER VI. MANGROVE CONVERSION AND CONSERVATION

> The main difficulty in managing and conserving mangrove forest areas stems from their unique ecological setting at the boundary of coastal water and land. This location guarantees that there will be conflicts of interest in general as well as conflict between the different administrative authority sectors and parties managing mangroves. This becomes apparent in the regulations of various jurisdictions issued by the agencies administering coastal areas occupied by mangrove swamps. The products of these conflicts are unclear and somewhat conflicting roles, functions and authorities for the various central and local government agencies as well as for the various stakeholders (translated from: Asian Wetlands Bureau, 1992. Appendix G.3).

6.1. INTRODUCTION

This chapter presents results from the second case study of this research, the Mangrove Case Study. The research questions addressed in this chapter, as introduced earlier in Chapter 1, deal with comparison of conversion and conservation practices of mangrove habitats. The following three research questions lead the inquiry into this mangrove utilisation: *What are the rationales behind the conversion of mangroves to shrimp ponds?, What are the rationales behind mangrove replantation by local communities?,* and *How are the roles and meanings of mangroves associated with communities' dependency on, and appreciation of, this ecosystem?*

Analytical approach for this chapter has a different structure to the coral reef case study presented in the previous chapter in that direct comparison is performed between two sites chosen to represent two starkly-different states of mangroves, at opposing ends of a spectrum of mangrove utilisation. This chapter examines the sustainability of the mangrove utilisation patterns by investigating what has happened at these two sites with their very different outcomes. The implications of these differences are analysed from a resource management perspective. This case study examined mangroves in the settings of Lamurukung Village and Tongke-tongke Village. Both villages are located on the east coast of the South Sulawesi Peninsula, facing the Bay of Bone. The two sites are separated by approximately 100 km of

coastline from Lamurukung in the north to Tongke-tongke in the south (see Figure 4.1. in Chapter 4).

This chapter first presents the current state of mangrove management in Indonesia: that is, a general overview of up-to-date data gathered during fieldwork regarding the condition of mangroves and the arrangement of the institutions responsible for their management. This is followed by the presentation of findings from the mangrove case study. This comprises field findings regarding the conversion of mangroves into an intensive shrimp farming enterprise in Lamurukung and the community-based replantation of mangroves in Tongke-tongke. The findings from this case study are then analysed in terms of the meanings and roles of mangroves through comparisons of the perceptions and attitudes toward mangroves of the local people from the two villages. The last part of this chapter discuss the viability of a sustainable livelihood for local communities by drawing philosophical comparisons between the conversion and conservation approaches inherent in each method or approach to mangrove utilisation.

6.2. INDONESIAN INSITUTIONAL ARRANGEMENTS FOR MANGROVE MANAGEMENT

As one of the most valuable coastal resources and ecosystems in Indonesia, mangroves have been seriously ignored by the governmental institutions concerned with managing them at multiple levels. Although mangrove ecosystems have tremendous value for their associated species and coastal communities, they are being destroyed at an alarming rate in Indonesia and elsewhere. Alongi (2002) observed that approximately one-third of the world's mangrove forests have been lost within the last five decades. Projections suggest that mangroves in developing countries are likely to decline another 25% by the year 2025 (McLeod and Salm, 2006).

The estimated total area of mangrove forests in Indonesia in 1990 was 4.25 million ha, which represented about 20% of the estimated world's 21 million ha of mangroves at the time (Choong et al., 1990). Current global mangrove-area estimates range from 3 to 15 million ha - the most recent being that of McLeod and Salm (2006), who suggest that this ecosystem now occupies about 14.6 million ha of tropical and subtropical coastal environment. The Indonesian Ministry of State for the

Environment in 1996 released an estimate of the mangrove area in Indonesia which was 3.2 million ha (Dahuri 2003, p187). Due to its extent the Indonesian mangrove ecosystem represents a massive natural resource, not least in terms of managing and maintaining its sustainability.

One important reason for the general trend of decline of mangrove areas is their status as a common pool resource. Coastal water is generally considered to be an open resource, notwithstanding that it is under direct control of the state (Adger and Luttrell, 2000). Furthermore, as Ostrom (1990, p.8) suggested, open access regimes such as open seas and the atmosphere have long been considered to be, or to have, resources that "belong to everyone yet are the responsibility of no one". The absence of any formal property rights system allows everybody access to utilize the existing resources in coastal waters.

The governance regime for Indonesian coastal resources is based on the 1945 Constitutional Provision. Article 33 paragraph 3 attests that "land and water and natural resources therein shall be controlled by the State and be utilized for the greatest welfare of the people" (GoI, 2005, p.13). Based on this stipulation, the government of Indonesia has duties to plan, organize, actuate, and control the utilization of natural resources and the environment. The national policy to implement these management activities is formulated in the Broad Guidelines of the State Policy (*Garis-garis Besar Haluan Negara* or GBHN), decreed by the People's Consultative Assembly once every five years. The 2004 GBHN for the long-term development of natural resources and living environments advocated, amongst other things, the 'rational management' of all of Indonesia's natural resources. However, very few of the indicators and measurements needed to operationalise such an amorphous term as 'rational management' exist in Indonesia, meaning it remains only a paper term, while on the ground the problems for achieving any rational management of mangroves are highly complicated.

The legal basis for the management of mangroves in Indonesia is regulated through Act No. 41 of 1999, concerning forestry, also known as the Forestry Act. This Act addresses forestry activity in Indonesia, including management, planning, inventory, conservation, rehabilitation and reclamation of forests. It also addresses research, development and human capacity to act on forestry matters. This Act does not directly address the management of coastal resources, but forestry activities in upland areas have the potential to impact on, and may create problems in, coastal

areas downstream. Further, under this Act mangroves are included in the Article 6 definition of forests such that the forest management system can be used to address mangrove conservation, production and reserves.

Mangrove ecosystems are an important area for fisheries management. They can function as a nursery ground for some fish and marine species as well as a buffer zone or filter area for coral reef ecosystems, reducing their exposure to pollution and sedimentation from land-based activities. Excessive and illegal logging of mangroves and other, terrestrial, forests results in the destruction of coral reef and fish ecosystems. Mangrove forest management is, thus, a sensitive issue nested between the interests of forestry and fishery activities, including coral reef management. There is no single article in the Forestry Act that discusses or explains the relationships between these two sectors. This situation has resulted in increasing conflicts of interest between these two sectors and their stakeholders.

Coastal waters in Lamurukung and Tongke-tongke, the research sites for this mangrove case study, like other parts of Indonesia, are managed based on the normative assumption of rational management. As the findings of this case study illustrate, many situations on the ground in Indonesia do not necessarily reflect (and sometimes even contradict) the normative existence of resource management instruments. This case study was designed to explore the dynamics of mangrove utilisation in order to present a picture of the relationship between mangrove resources and their users, as well as to examine the dynamics *amongst* different users. This chapter presents findings from field investigations analysed in order to answer the following research questions: What constitutes sustainable and unsustainable uses of mangroves?; Which stakeholders are responsible for damaging the mangrove resources?; Which stakeholders, if any, are successful in mangrove conservation efforts? Finally the chapter addresses the question: Which factors are of significance in the processes of conversion and conservation of mangroves?

As a general overview, Figure 6.1 presents the economic values associated with mangroves as determined from field observations. This diagram adopts the concept of Total Economic Value (TEV) according to Daly and Farley (2004) as a way of representing the value of mangrove ecosystems known to the local communities. This was used as an entry point to understand the communities' relationships to mangroves at each field site.

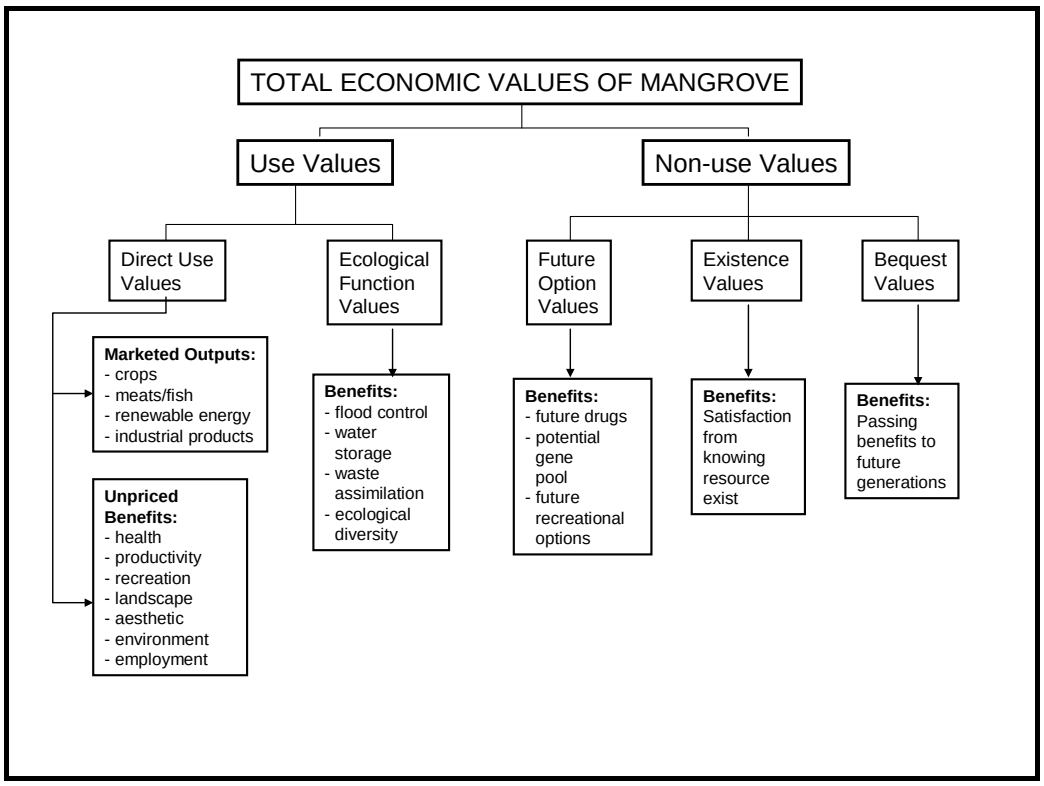


Figure 6.1. The economic values associated with mangroves observed in the field sites of Lamurukung and Tongke-tongke (adapted from the 'Concept of Total Economic Value of Resources' in Daly and Farley, 2004 and Ecological-Economic Valuation from Turner *et al.*, 2001).

As shown in the diagram, the TEV of mangroves generally consists of two distinct categories: use and non-use values. Use value therefore relates to the values that arise from the direct use of mangroves by consuming them or their services. Use values are then divided into two categories: direct and indirect use values. Direct use values include values from marketed outputs of logging, timber, aquaculture, fishing, hunting of species associated with mangroves, and collection of non-timber products from the forest. Barbier and Cox (2004) indicates that indirect uses are mainly derived from the ecological services provided by the mangrove ecosystems such as wave/storm breakers, sediment traps, and the provision of marine nursery grounds.

According to Daly and Farley (2004), 'non-use values' are not based on the actual use of mangroves. Rather, these values are placed on the mere existence of the resource. In accordance with this, 'option value' refers to the value put on the mangroves' possible future use, such as the biodiversity of mangroves as a gene pool with high potential to contribute future drugs, or merely for future recreational

options. ‘Existence value’ is the value placed on the mere fact that mangroves, and the functions they support, exist whereas ‘bequest value’ is placed on the ability to preserve the mangroves so that they can be used by future generations. Finally, the ‘total economic value’ of mangroves to these communities is defined by people’s knowledge of, and access to, each of these composite values.

Table 6.1. Species composition of the study site mangrove forests.

No.	Species	Local name	Observed in	
			Lamuru Kung	Tongke-tongke
1.	*Rhyzopora mucronata*	Bakko / Bakau tokke	√	√
2.	*Rhyzopora apiculata*	Bakko / Bakau lonro	√	√
3.	*Rhyzopora stylosa*	Bakko / Bakau merah	√	-
4.	*Avicennia alba*	Api-api bolong	√	√
5.	*Avicennia marina*	Api-api laut	√	-
6.	*Avicennia officinalis*	Api-api bakar	√	-
7.	*Sonneratia alba*	Padada	√	√
8.	*Sonneratia caseolaris*	Gogen	√	-
9.	*Bruguiera cylindrica*	Tancang sukun	√	√
10.	*Bruguiera gymnorrhiza*	Kajang kajang	√	√
11.	*Bruguiera parviflora*	Sia sia	√	-
12.	*Nypa fructicans*	Nipa	√	√
13.	*Ceriops decandra*	Cokke	√	√
14.	*Aegiceras corniculatum*	Otti-otti	-	√
15.	*Acanthus ilicifolius*	Jaruju hitam	√	-
16.	*Hibiscus tiliaceus*	Haru	√	-
17.	*Pandanus tectorius*	Pandan	√	√
18.	*Terminalis catappa*	Ketapang	√	√

In addition to the above preliminary economic assessment, a preliminary ecological assessment was also applied to obtain a general picture of the species composition that makes up the mangrove forests in each study site. Due to the lack of reference data on the species composition of these forests rapid assessments were performed at each site, the results of which are presented in Table 6.1. It was found that, of the 18 species identified in the assessment, 17 exist in Lamurukung, in comparison to 11 in Tongke-tongke. A possible explanation of this is that the mangrove forests in Tongke-tongke were mostly a result of replantation, and therefore tend to have one dominant species as a consequence of monocultural planting practices. Furthermore, the Tongke-tongke forests are relatively young, having been

planted mostly in mid 1980s and since. On the other hand, the mangroves in Lamurukung are mainly older. Although the remaining mangroves in Lamurukung comprise scattered patches, and their biomass is comparatively less than the mangrove plantations in Tongke-tongke, they are mainly the old-growth product of natural forest generation and, hence, are more diverse in species composition.

In relation to the above findings, it would be interesting to know the impact of the state of these mangroves on their associated species, which are also key to the biodiversity of the mangrove habitat as a whole and the trees themselves. Gunarto (2004) reported that in Tongke-tongke, 27 fish species and 4 shrimp species were entering the mangroves during high tide. He further found that 5 species of crabs, and 16 species of macrozoobenthos (gastropods and bivalves) were living in the Tongke-tongke mangrove soil. Ampulembang (2006) studied the Lamurukung mangroves, finding 17 species of fish, 3 species of shrimps, 5 species of crabs and 10 species of macrozoobenthos dwelling there. These studies show that, although the Lamurukung mangroves are more diverse in their tree species composition, the associated species were found to be more diverse in the Tongke-tongke mangroves. This suggests that, although the Lamurukung mangrove trees are more diverse than those in Tongke-tongke, they are not necessarily attracting more associated species. This is mainly due to the fact that the mangroves of Lamurukung have less biomass, are less dense, and have been exploited quite heavily. In contrast, the Tongke-tongke mangroves are mainly still young but the habitat they provide is highly fertile and, therefore, attracts many more associated species.

Further comparisons between the two sites were made in terms of their socio-economic development relative to their environmental history. To summarize the comparison between the two villages, Table 6.2 presents a 20-year timeline that compares the development of the two villages' mangrove resources from the early 1980s to the early 2000s.

Table 6.2. A tale of two villages: timeline comparing the state of mangrove resources and their utilisation between Lamurukung and Tongke-tongke from 1980-2005 (consulted and collated from several sources and primary data).

LAMURUKUNG	TONGKE-TONGKE
1980-1985	
- village characterised by lush green mangrove forest and pristine wetlands - famous for its giant mangrove crabs (*Scylla serrata*), caught by locals from inside mangrove-forest habitat - several inhabitants cut down some small areas of the mangrove forest to open small scale shrimp rearing ponds.	- the village was situated on the edge of an eroding coast - during high tides, sea water flowed underneath resident's stilt houses - some village inhabitants began to plant mangrove trees after learning that the neighbouring village of Pangasa had been saved and protected from winds and waves by the existence of a buffer of mangrove forest.
1986 – 1990	
- PT. SERDID & Co, a private company, obtained a licence to convert the mangroves into large-scale shrimp farms - PT.SAU took over from SERDID and continued shrimp farm development - the first stage of the project, 125 ha out of the total planned 540 ha conversion, was finished and ready for operation.	- an organisation of village members who planted mangroves was formed, named *Aku Cinta Indonesia* (ACI), literally meaning 'I love Indonesia' - ACI effectively organised the mangrove replantation programme as a bottom-up way of managing the habitat - The village acquired its own electricity line.
1991 – 1995	
- the Stage 1 ponds were operated at full capacity: peak production was achieved in 1994 with maximum yields of 12 tonnes per hectare and average yields of 9 tonnes per hectare - the MBV (monodon baculo virus) shrimp pandemic reached the area, production declined and never recovered.	- ACI was awarded the *Kalpataru*, national government recognition for eminent achievement in environmental conservation efforts - The village roads were upgraded: Asphalt road went from the district capital into Tongke-tongke.
1996 – 2000	
- PT.SAU had to reduce labouring staff and rationalize its operation - the company closed in 2000 and filed for bankruptcy, leaving a vast area of empty, polluted ponds and a large number of environmental problems to be borne by the local community	- Tongke-tongke became widely known as a good example of how a local community was mobilized to manage its own resources and a centre of excellence for mangrove replantation

2001 – 2005	
- Following the 1998 economic crisis, a large flow of migrant labour (TKI), mainly local youth, went overseas, mostly to Malaysia and Arabic countries - Several attempt by PT.SAU owner to resurrect the company failed to bring fruitful results. Several ponds were rented out but products were minimal. - PT.SAU assets were still on offer, but there was no serious bidder.	- ACI underwent a restructuring, following internal conflict among its executive committees. - Local community has adopted mangrove conservation and management for their sustainability as part of their daily lives. - District government promoted Tongke-tongke as an ecotourism destination.
2005 – 2008	
- The village has been growing in term of population. A few outsiders from different ethnic groups come to settle in the village after finding that land here is relatively inexpensive. - There is a plan to build a mid-sized fish landing facility and port in Lamurukung as part of the newly elected Bupati's (district head) campaign promise. - PT.SAU's ponds still remain largely empty. Several ponds were rented and being operated by smaller enterprises in collaboration with local people to grow crabs.	- The district government built a 250m long bridge (wharf) across the mangrove forest out to the sea as a recreational and tourism facility. - Some area has been converted into *tambak*, leaving a small strip of young mangrove plants as a buffer from the sea. - The neighbouring villages have also been replanting mangrove, building on the earlier success of Tongke-tongke. - Tongke-tongke has gained more popularity as an ecotourism destination as well as a field lab for the study of mangroves

Lamurukung in 1985 was an isolated coastal area almost-entirely covered with green lush mangroves and other wetland vegetation. The village then embarked on hosting a large industrial-scale integrative shrimp farming enterprise, a change which resulted in more than half of their mangroves being uprooted and the habitat being converted into shrimp-pond facilities, achieving peak shrimp productivity in the early 1990s. A decade later, after suffering a shrimp disease pandemic which destroyed most of the ponds' productivity, the company had to shut down, leaving behind long-lasting environmental impacts. The village was left with only patchy mangroves by 2005. In contrast, Tongke-tongke literally sat on the edge of Bone Bay in 1985 and was on the brink of losing its land to coastal erosion. Subsequent local community initiatives mobilized the villagers to plant mangroves, thereby gradually reducing the

impact of erosion, reclaiming the coast, and safely 'fencing' the village with a protective buffer of mangrove forest.

6.3. THE CONVERSION OF MANGROVES AS A DESTRUCTIVE UTILISATION

> In southern Sulawesi, a worker beheads prawns all day for a dollar; in a restaurant in downtown Tokyo, a customer licks his lips (Yoshinoro, 1986, *in* Lucas, 1998, p. 202).

One of the main utilizations of coastal environments in Indonesia is the cultivation of shrimp in managed earthen ponds locally known as *tambak*. This term refers to a generic derivation of shrimp farming or shrimp culture (Bardach *et al.*, 1972; and Chamberlain, 1991). Methods of *tambak* operation in Indonesia vary widely from small-scale, low-input, traditional operations to those that are large-scale, highly-intensive, and use a high level of technology and initial capital inputs. Most coastal communities across Indonesia have operated *tambak* in various small-scale, traditional forms ever since they inhabited the area (Ahmad, *et al.*, 2003 and Dahuri, 2003). The technology for tambak operation has been growing and applied in Indonesia for over several hundred years. Schuster (1952) reported the activity of local coastal communities in Java culturing fish in brackish-water ponds as early as the turn of the century. Boomgaard (2007) indicated that the method of fish cultivation in earthen ponds had been practised in ancient kingdoms, such as Mataram in 900 A.D.

Lucas (1998) reported that by 1983 most Indonesian coastal waters had been overfished by large Japanese trawlers fishing for shrimps. This finding came three years after a total trawling ban was instituted in all parts of Indonesian waters. Cultivation of the Giant Black Tiger prawn (*Penaeus monodon* or *udang windu* in Indonesian) started in many coastal communities in Indonesia in the early 1970s. It was found to be compatible with milkfish (*Chanos chanos*), and has continued to be the most valuable commodity for cultivation in *tambak* ponds. In 2005, the right size of tiger prawn was worth up to ten times more per kilo than milkfish (Lem, 2006).

In response to the steadily increasing demand for seafood on the world market and the temptation to bring in much-needed foreign exchange, the government of Indonesia, with support from international development agencies, directed a series of systematic efforts to promote *tambak* intensification with the goal of increasing

shrimp exports (DGF, 1991). In 1984 the Indonesian government announced a national *tambak* intensification (*Intam*) project aimed at boosting the cultivation of shrimp in brackish-water aquaculture in five provinces, including South Sulawesi. One aim was to earn foreign currency, thereby compensating for the loss of shrimp exports from the prohibition of shrimp trawling. Japanese specialists were flown in to provide technical expertise in setting up privately-owned commercial fry hatcheries. These operations were encouraged in the mid 1980s by the government in both Java and South Sulawesi.

The destruction of mangrove forests both specifically in Sulawesi and, in general, in Indonesia has been closely connected to the conversion of this ecosystem's area to shrimp ponds, driven mainly by the high demand for shrimp products on the Japanese market. Ahmed (1997) indicated that a substantial portion of wetland and mangrove areas along the Indonesian coast was converted into *tambak* through high intensity capital and technology investments. Thanks, in part, to such efforts Indonesia emerged as one of the eminent world suppliers of aquaculture products, especially in the cultured shrimp market. Since 1992 Indonesia has consistently been one of the world's top ten cultured-shrimp producers. With a total production of a little over 200,000 tonnes in 2005, for example, Indonesia ranked fourth in the world, behind China, India and Thailand (Lem, 2006). While detailed studies of the environmental impacts of the development of *tambak* have yet to generate conclusive results, one outcome is clear – that the destruction of South-East Asian mangroves, in and beyond Sulawesi, has occurred as shrimp farming has expanded (Boomgaard, 2005; Barbier and Cox, 2004; Lucas, 1998).

In Indonesia high-intensity *tambak* expansion first took place mainly around Java Island, especially along the north coast. However, this expansion soon also happened around the outer islands of the country, including around Sulawesi. The first intensive *tambak* was developed in Sulawesi in 1982 (Poernomo and Cholik, 1996). This was soon followed by rapid development of shrimp hatcheries along the west coast of Sulawesi, one sign of the sudden increase in demand for shrimp fries. From the west coast this operation expanded to the east coast. In addition to the need for more space for the intensification effort, this expansion was mainly driven by the need to look for more-fertile and pristine brackish areas, a key biological requirement for supporting shrimp growth. This expansion reached further into remote areas along coastal districts such as Sinjai, Bone, Wajo and Luwu. In Bone District, this expansion

started with the arrival of heavy equipment in Lamurukung Village as early as 1986 brought by PT. SERDID, a company that started the shrimp pond venture which later sold its concession to PT. SAU.

Lamurukung Village hosts *Perusahaan T erbatas Sul awesi A gro Utama* (PT.SAU), a private company that came to invest in 1988 by building a vertically-integrated facility for Black Tiger Shrimp production for export. It is called 'vertically integrated' since it combines the facilities and businesses from the hatchery upstream, which provides shrimp fry, downstream to the shrimp feed supply, to growing ponds, and to the cold-packaging facilities ready for export. The facility was a state-of-the-art large-scale shrimp production complex, consisting of a shrimp hatchery, feed mill, cold storage and approved concession for 545 ha of intensive shrimp ponds.

The plan to build a shrimp aquaculture facility covering over half of the village's coastal boundary was met mainly with optimism, high hopes and, most of all, welcome gestures by the Lamurukung people. Little did they know that the project would result in significant and lasting negative impacts on their environment and livelihoods long after the company had closed its doors. The following quotation from a respondent interviewed in Lamurukung provides the nuance of the general feelings of the local community in welcoming the big company:

> My first reaction upon hearing about the initiation of this project was: oh good - it will finally open this village from isolation and bring lots of opportunities for the local community. I was especially delighted to be told that the company would absorb as many local youth as possible to work in it. (ASA, 67-year old male, long-serving village head of Lamurukung, Lamurukung 8 December 2005).

The process of land clearing which produced lasting impacts on the environment was among the most significant processes to capture the attention of the villagers in Lamurukung:

> Clearing up the wetland to prepare for pond construction was a real challenge. Very often I had to drag up a huge, massive log the size of a car and, oh yeah, the mangroves - they were really hard to uproot. It was like fighting with an octopus! The machines operated for 24 hours a day and we were divided into three shifts. The schedule was really tight. (AMR, 50-year old male, former heavy equipment operator, Lamurukung 8 December 2005).

For phase one, the company built 125 ha of intensive shrimp ponds. These were built on areas converted mainly from wetland, with a mixture of mangroves and nipah vegetation, as well as from conversion of some old, low-productivity ponds

once owned by locals. The company started to produce shrimp in 1990 and absorbed a great deal of the workforce from Lamurukung and the surrounding settlements. The locals were mainly employed as labourers: very few were promoted to middle management. The following two quotations provide a good example of how the local community, especially the young workers, perceived the opportunity offered by the company:

> Very few people in this village finish their tertiary study and get a degree. I am one of the selected few. Meanwhile, the management of the company [PT.SAU] had once promised to give priority to employing local people, especially if they were university graduates. So when I got my BA in Theology from the College of Religious Studies, my father was so proud that he hurriedly took my certificate and personally handed it in to the company's office. Well, the company did not know what to make of my degree so they assigned me to be a field worker, with the duty of feeding the shrimp, much to the dismay of my father who had high hopes high for me to take on a role in management, or something where I'd sit behind a desk. (AML, 42-year old male, former PT.SAU worker, Lamurukung 9 December 2005).

> I quite enjoyed my time working for the company [PT.SAU]. It didn't pay much though, being just a field labourer. But I was young, didn't have anybody to feed but myself, and I even still received money from my parents. The thing is, being an employee of PT.SAU was something that people in this village took pride in. They didn't care whether you were just a field boy, a technician, or were just running around inside. It was such a privilege to be known to work in a 'big company'. It really was about getting status rather than getting the money. (RMT, 28-year old male, former field worker of PT.SAU, Lamurukung, 18 October 2005).

Other respondents reported that the many jobs and economic spin-offs brought into the village by PT.SAU changed the image of Lamurukung from a silent and isolated village to a vigorous and dynamic place. The local village market, which used to open only once a week, was suddenly crowded and busy and had to open every day for the whole day and into the late night. During the height of activities, Lamurukung resembled a bustling city. In the morning, hundreds of pond-construction labourers arrived and started their work. Soon they were followed by the hundreds of labourers for the grow-out pond, the feed mill and the cold storage. Trucks delivering supplies came and went. Food vendors lined the street from the village centre to the project site ready to serve all those workers. At night, the sound of diesel-powered electric generators never stopped, along with that from the paddle-wheel aerators in the ponds. The workers roamed around, checking and feeding shrimps 24-hours a day. The neon lights illuminating the ponds made the project site bright and sparkle just like nightlife

in the city. The village just never slept then. The comment from the Village Head of Lamurukung below nicely sums up the atmosphere and feeling of local community during the height of PT.SAU production:

> It was lively and active. It was just like being in a city, bright lights at night and the hustle and bustle of people working during the day. We thought, we finally live in a modern world. (ASA, 67-year old male, long-serving village head of Lamurukung, Lamurukung 8 December 2005).

Peak production was achieved in 1994, when the pond technicians managed to produce an average of 10 tonnes of shrimp per ha per season for the whole 125 ha of ponds. This was certainly perceived as an achievement in comparison to traditional ponds, which only produce an average 300 kg per ha per season, or one thirtieth of the company's productivity level. Everything seemed fine with the production, and a plan to build another 250 ha of ponds was being prepared for phase 2 when suddenly the *illuminous disease*, a type of shrimp disease caused by *monodon baculo virus* (MBV) hit the area and become a pandemic, soon reducing production. Local people record the onset of the problem:

> I was telling people, long before its collapse, that such a product boom wouldn't stay long. This is an activity of rearing living organisms. It involves lots of living existences: people's lives, shrimp's lives and the lives surrounding them. You have to respect them all. Yet, PT.SAU had broken too many taboos, things that we traditionally believe and respect. It was only a matter of time to see its end. (KMR, 63-year old male, former worker of PT.SAU, Lamurukung, 19 October 2005).

> For several nights I felt uncomfortable. I could feel that the shrimp didn't eat, they seemed to lose their appetite. I asked other workers who were responsible for shrimps in other ponds, and similar concerns were felt at that time. We had already heard about this type of viral disease striking in Java, and we had been hearing cautions that it was only a matter of time until it arrived in Sulawesi. Then it happened one night. Thousands of shrimps went up swimming on the surface, going around and looking like they were gasping for air. No doubt, we had been hit by MBV. That spelt the beginning of our downhill production. (ADJ, 45-year old male, former worker of PT.SAU, Lamurukung, 18 October 2005).

After much trying, it was found that production rates could not be recovered and they instead went downhill thereafter. By 1999 most of the workers had been laid off, and in 2000 the company was closed and filed for bankruptcy in the midst of the economic crisis that was coincidentally enveloping Indonesia. The company was

eventually forced to shut down its operations, lay off the workers and close its doors, leaving the local community to deal with whatever was left from the enterprise.

The first impact of PT.SAU closing was felt by the local businesses, which suddenly lost their customers. Labourers who had moved to the village and who used to pack the central village of Lamurukung had gone to find jobs somewhere else, while local labours were contemplating joining the exodus of migrant workers. The following two quotations illustrate how the situation developed in that tough time:

> One by one, people packed their stuff and left this village. My younger brother decided to go to Malaysia to work in a Palm Oil plantation as soon as he got laid off by the company. All of a sudden the village was empty. I used to have customers lined up for haircuts in my salon. Now, I've got no customers. I wish they'd reopen the company and life here would go back to what it was. (MGW, 45-year old female, Lamurukung, 9 December 2005).

> There's nothing to expect here. I don't think shrimp will grow well like they used to, [because] the water source is already contaminated. If I were still in my 20s, or 30s at least, I would go overseas to find a job. But it's hard for me [to restart], and my family is here. My only expectation is that one day my children will be ready to compete and they will be able to go wherever they like. (AML, 42-year old male, former PT.SAU worker, Lamurukung 9 December 2005).

Another legacy that PT.SAU left in Lamurukung is that of environmental impacts. Local people reported several environmental problems that arose during the farm's operation, and soon after its closing, including: it was harder to find freshwater, the freshwater table dropped, salt water intruded into the local wells, the shrimp pond waste polluted the river, there were habitat and species losses in mangrove areas, and there was increased potential for coastal erosion. One of the respondents commented on this problem:

> My father dug this well. The water used to be very fresh. I remember as a kid I loved to drink directly from this well - it was really refreshing. Now the taste has changed. It tastes salty and brackish. We only use the water for washing and cleaning purposes now. For drink and food we need to get water from other wells further upland, or buy from the water vendors that go around the village. (DWA, 35-year old male, Lamurukung, 9 December 2005).

During fieldwork it was interesting to note how the primary actors in the shrimp-farm venture perceive what happened and the role they played in creating the situation. Interviews revealed very strong top-down, paternalistic perspectives and approaches to articulating their role, including the importance of that role within the country's development perspective. This is not entirely unexpected, especially since the venture

occurred during the time when centralised planning and decision making was the dominant mechanism used by the Indonesian development regime.

> A lot of my friends wondered what on earth was I looking for by coming into Lamurukung. Why would an MBA graduate want to go there and risk his life in a jungle? Well, I think it was partly to seek a challenge, but most of all it was my belief that such a project would help this village to alleviate poverty and that my work might help to bring some prosperity to these poor folks in this remote village. (AAA, 57-year old male, former general manager of PT.SAU, Jakarta 4 February 2006).

> I was offered this business through my contacts in government, who at the time were looking for a reliable business partner to implement a government-donor agreement. The calculations looked really good on paper, but it turned out it wasn't as much in the field. I came to Sulawesi with full support of the national government and of the international donor, in the hopes of producing much-needed foreign exchange. Yes, we expected to make money, but I was more concerned about the fair distribution of development in this country, and that means taking the development out of Java, the main island, and bringing it somewhere else less-developed. It was my personal choice to go east, and eventually I came to Lamurukung. Despite how it turned out, and whatever happened there, everything was done for the good of the country. (ALT, 65-year old male, former president director/ owner of PT.SAU, Jakarta 5 February 2006).

During the 2005-6 interviews I found a strong hope amongst the community and from their leader that one day the company would be back in operation and the economic spin-offs that were once enjoyed in this little village would come back again. Nevertheless, in realizing that five years have passed since the company closed its doors, respondents knew that the liklihood of this happening had become very slim. The village Head has his own thought about what might be done:

> I'd love to tell Mr. ALT [the PT.SAU owner] that it would be best to return this land under his concession back to the local peasants who originally operated the land before it was taken by PT.SAU. We can certainly negotiate and arrange a method of payment which allows the local community here to make use of these unproductive and idle ponds. (ASA, 67-year old male, long-serving village head of Lamurukung, Lamurukung 8 December 2005).

When I visited the site at the end of 2005, the business was still on the market for sale, yet no one had expressed any serious interest in it (Figs 6.2, 6.3). Another visit in December 2007 showed that nothing much had changed except, this time, the owner of SAU was more interested in finding a partner with whom he could get the shrimp cultivation running again, as he put it, like it used to be.

Figure 6.2. Irrigation infrastructure made from concrete cement. It is one of the 'landmarks' that lies unused amongst the idle ponds. Pictures were taken in January 2006.

Figure 6.3. Previously vital infrastructure. The electric cable poles (left) and the electric generator (right) are two parts of the infrastructure that used to be vital for the operation of the ponds. Pictures were taken in January 2006.

6.4. COMMUNITY REPLANTATION AS A CONSERVATION MEASURE

As an antithesis to the loss of mangroves and inability of the community in Lamurukung to prevent such a loss and the resulting dreadful impacts on their environment, the second study examined Tongke-tongke village, which provides an example of how a local community mobilized themselves to plant mangroves in order to save their coast and, subsequently, their village.

Tongke-tongke village, which is located five kilometres from the town of Balangnipa, the capital of the region of Sinjai, enjoys good access to trading, education, and district administration activities. Tongke-tongke consists of five hamlets, which are Maroanging, Baccara, Bentenge, Cempae, and Babana. The last hamlet is the central area of village administration.

The topography of Tongke-tongke village is comprised of the mainland, coast and ocean. The size of the mainland area of the village is 414.45 ha. This figure mainly represents areas of upland soil and excludes the low intertidal and wetland areas where most of the mangroves grow. On the mainland, there is a mountain range which people use for agro-forestry, grazing for cows and goats, as well as for several commercial plant crops such as banana, coconut, and mango. In addition, flat areas of the mainland are also used as rice fields. These fields are dependent on rain for irrigation and, as a result, the harvesting of rice is only conducted twice a year. The total area of rice fields irrigated by rain is estimated at 150 ha, and they are located in the hamlets of Baccara, Bentenge, and Maroanging.

The total number of inhabitants in Tongke-tongke is 3,056 and the total number of households is 544 (Bappeda Sinjai, 2005). The majority of inhabitants are employed as fishermen and farmers, while a small number work as merchants, and civil servants. Farmers are concentrated in the hamlets of Baccara and Bentengge, while fishermen generally live in Babana and Cempae.

Fishermen usually go to sea twice a month, with each trip lasting from 9 to 14 days. Their fishing grounds are from Bone Bay, Flores Sea and as far as Banda Sea. Data from Bappeda Sinjai (2005) indicated that these fishermen predominantly catch pelagic fishes such as frigate mackerel (*Auxis thazard*), scads (*Decapterus* spp.), and sardines (*Dussumieria* spp) as well as also reef fishes like groupers (*Epinephelus* spp.), fussiliers (*Caesio* spp.), and threadfins (*Polynemus* spp). Their catches are

brought for sale to Sinjai, in particular, because the Sinjai Regency has a fish-landing centre facility locally known as TPI Lappa. This is the largest and most-popular fish landing market on the east coast of South Sulawesi Province.

Other local villagers manage either self-owned or rented fish ponds. The stocking densities and other input levels of these ponds depend on the availability of a water pump. Field assessment showed that these ponds were used for an intercropping system of three main products: milkfish (*Chanos c hanos*), large prawns (*Penaeus* spp.), and seaweed (*Gracillaria* spp). These three types of crops are often cultivated together in this way. This intercropping system is also known as polyculture, as these species particularly are biologically and technically compatible in terms of food and space.

According to the people interviewed and surveyed in the field, the education level attained by the village inhabitants varied from elementary school to university degrees. Most residents had not completed basic schooling. Economic factors were considered the main obstacle for parents wanting to send their children to formal school. It was quite common to find children working on fishing boats. These children preferred to work than attend school. Nonetheless, the respondents interviewed generally agreed that the current child education is better than what it was one or two decades ago.

Social institutions in Tongke-tongke are diverse, and include organizations focused on education, government, religion, youth, women, natural resource management, as well as self-help groups for economic independency. Furthermore, quite a few non-governmental organisations (NGOs) have come to Sinjai to operate. The existence of significant support from NGOs has facilitated the start of local organizations, especially those concerned with natural resource management and self-help groups.

History of Self-Initiated Mangrove Plantation

The coastal area of Tongke-tongke, along the Gulf of Bone, is now visibly covered in mangrove forest. This was not the case prior to the 1980s. Tongke-tongke in the 1970s was an endangered village sitting vulnerably on the edge of the sea, unprotected from high winds and waves. According to a verbal story told by one of the Tongke-tongke community elders, mangroves were cut down as early as the 1930s to make room for development and the expansion of traditional *tambak* construction

going right up to the edge of the sea, leaving very little space for mangroves to grow. The new unprotected *tambaks* were subsequently threatened and eventually destroyed by direct exposure to wind and waves.

By the 1970s, the natural mangrove forests had been depleted. Because the mangroves were no longer protecting the coast, erosion also became a pressing problem. During that time, fishponds and the people's settlement were regularly swamped by sea-water inundation, particularly during high tides. Tongke-tongke endured erosion of the coastal area for many years, being seriously damaged by huge winds and waves from the eastern seaboard. Faced with the possible consequence of losing their village permanently to the sea, the community decided to do something. However, it was not until 1985 that the community started to plant mangrove seeds which they picked from neighbouring places along the coastline. The effort was organized seriously by the community. After three years, rows of mangrove trees were growing on the coast, protecting it from strong waves, and the erosion trend had been halted to the extent that the coast was becoming more stable.

Few of the villagers I talked to could vividly remember the situation before the 1970s. A couple of elders from my respondents in Tongke-tongke depicted the situation as follows:

> We used to have chickens swimming around underneath these stilt houses during the high tides which overflowed into the village. (ARN, 54-year old female, housewife, Tongke-tongke, 22 January 2006).

> During high tides, sea water rose up to where we are sitting now, it was around knee height. Many people thought about moving. Well, that wouldn't be a problem if you had land up the hill, but most people here have nowhere else to go. So I thought we have no choice but to stay and find the right solution. (PTP, 74-year old male, former village head, Tongke-tongke, 23 January 2006).

Before replantation, erosion had removed a 15 m wide strip of coast and village housing land. The problem was particularly bad in the hamlets of Babana, Cempae, and Maroanging, which were elevated only around 30-40 cm above mean sea level (Asaad, 2004; and Gunarto, 2004). Faced with such grave flooding, erosion and wind problems, the village leaders at that time discussed various solutions with their village inhabitants. They agreed to build a type of breakwater constructed from massive reefs taken from the nearby coastlines. However, this effort failed as the

power of winds and waves proved much stronger than the breakwater structure built, and inhabitants found themselves again searching for an adequate solution (Asaad, 2004):

> The first thing that came to mind is that we need to build something that can act as a wall between us and the sea, something that can break the power of high charged waves or protect us from the strong wind. Then a few villagers took the initiative to start collecting coral stones and stacked them on the beach like a wall. But soon we realised that stones were not enough and such a construction could not stand long here due to the mudflat beneath. (HAM, 56-year old male, villager, Tongke-tongke, 24 January 2006).

> Somebody told me that people in the neighbouring village of Pangasa had succeeded in planting mangroves. So I thought, "hey let's just try that", and apparently we had the right soil for mangrove growth here. The seedlings were free, and they grew fast in our soil, so people were really keen to plant mangroves. (PTP, 74-year old male, former village head, Tongke-tongke, 23 January 2006).

In 1984, some village inhabitants began to plant mangrove trees, after learning that the neighbouring village of Pangasa had been saved and protected from winds and waves by the existence of mangrove forests. Mangroves in Pangasa were dominated by *Rhizopora mucronata*. An important factor that stimulated the villagers to plant mangrove was the strong role of the village leader during the planning and implementation activities of mangrove sowing. However, the first attempt at planting almost failed because of the different perspectives of the village inhabitants. Internal conflicts of interests occurred between fishermen and the inhabitants who planted mangrove trees. Village fishermen thought that mangrove trees would cover the area on which they used to moor their boats. They therefore removed many of the planted seeds. Only after much discussion between these groups was an agreement made. It was decided that not all coastal areas would be used as planting grounds and open spaces (open strips) would be left for the fishermen's boats:

> It wasn't easy at first. We used to get complaints from other parts of the community, especially the fishermen who thought that the mangroves would reduce or might even close their boat's access to the open sea. To address such concerns we then made an agreement that, in planting mangroves, there would be a special column for the boats to pass by. For every 50 by 50 m square of plantation, there would be a 10 m open space. Such an open strip also served

> as a border between the plantations that belong to different owners. (MTY, 65-year old male, ACI leader, Tongke-tongke, 22 January 2006).

From 1985-1995, the local community planted mangrove trees intensively and extensively along the coast. The villagers, in general, had no previous experience of planting mangroves and they learned to succeed through a process of trial and error. Dead trees were frequently replaced with new ones, as seeds were freely available. The topography and sediments of Tongke-tongke and the two rivers, Sungai Baringeng and Sungai Sanjai, which border this coastal village, made it a very suitable place for mangrove growth. People in Tongke-tongke planted *Rhizophora mucronata* obtained from the neighbouring villages of Pangasa and Mangarabombang and then constructed sylvofishery-type fishponds after the forest was established.

In 1986, an organisation of village members - a group of 100 families who were actively involved in mangrove plantation - was formed called *Aku C inta Indonesia* – I love Indonesia (ACI). The aims of this organisation are to effectively create coordination amongst members as well as to legitimise the programme of mangrove forest rehabilitation. The participation of the formal village leader at that time in the Samataring sub-district also greatly contributed to the creation of ACI. In 1995, ACI represented the Tongke-tongke community in receiving the Kalpataru, a Presidential award in recognition of their self-initiated environmental rehabilitation effort. This award emphasised the significance of the replantation efforts.

The success of the new mangrove ecosystem area of Tongke-tongke was seen as a symbol of the community's self-initiated efforts to save their own environment and their livelihood and, as a result, Tongke-tongke has become well known for its mangrove reforestation activities. In other words, mangrove forests have created a unique identity for Tongke-tongke village. People from other places now come to Tongke-tongke to learn about mangrove conservation.

The mangrove planting was still being carried on at the time of fieldwork, when the breadth of mangrove reaching out to sea ranged from 300 to 500 m along the Tongke-tongke coast. It was reported that the total coverage of mangrove forest in Tongke-tongke in 2005 amounted to over 518 ha, or approximately one fifth of all the mangroves in Sinjai district, which comprises 1, 157 ha (Bappeda Sinjai, 2005). When I visited the place at the end of 2005, it took almost one hour to paddle a small canoe

out to the open sea from the point where the outermost edge of the land used to be in the 1980s.

6.5. ROLES AND MEANING OF MANGROVES

There is no doubt that mangroves have significant importance to the lives of communities in both villages chosen for this mangrove case study. The site selection criteria for the case study was based on this common factor. However, community-mangrove relationships in the two sites have been developing in different directions, and with different dynamics, over the last two decades. This study aims, in part, to assess in what aspects the two communities' relations with mangroves are different.

This section presents the results from an exploration of the relationship between the communities and their mangroves. I sought to discover differences and understand similarities occurring between the two villages. In order to have a better understanding of the perspective of the communities in both villages, in addition to direct observation and focus group discussion in each village, a series of in-depth interviews were conducted. The following results were based on the field assessments in these two villages. The number of in-depth interview and survey respondents from Lamurukung and Tongke-tongke were 21 and 25 respectively.

The following presentation of these results is organized, in line with the structure of discussions with the respondents, into three subjects: (1) the dependency of the community on the mangroves, (2) community appreciation of the ecosystem, and (3) aspects of mangrove management in both villages.

6.5.1. Dependency on Mangroves

Interdependency is very useful for providing insight into the dynamics of community-resource relationships. While the state of resources inevitably depends on how the community treats and uses them, it is more important to know how the community itself depends on the resources. In order to understand the dependency of the local community on mangrove ecosystems a series of questions directed at investigating this topic, amongst other related topics, was discussed with the respondents during interviews in the two villages.

Table 6.3. Results from interview questions exploring the subject of community dependency on mangroves.

DEPENDENCY ON MANGROVES % of respondents who:		Lamuru Kung	Tongke tongke
a.	Thought that mangroves are important	86	92
b.	Claimed that their livelihood was directly dependent on mangroves	48	76
c.	Claimed that mangroves were somehow related to their livelihood	81	88
d.	Worried about their livelihood if mangroves were to be depleted or deteriorated	48	84
e.	Procured daily food directly from the nearby mangrove forests	38	68
f.	Recognized the need to protect the remaining mangroves	90	88
g.	Feared that mangroves will one-day be entirely finish	95	60
h.	Considered leaving or moving if there were no more mangrove in their vicinity	57	92
i.	Recognized that loss of mangroves is actually a loss to the whole community	95	80
j.	Thought that future generations need the mangroves as much as they did	95	84

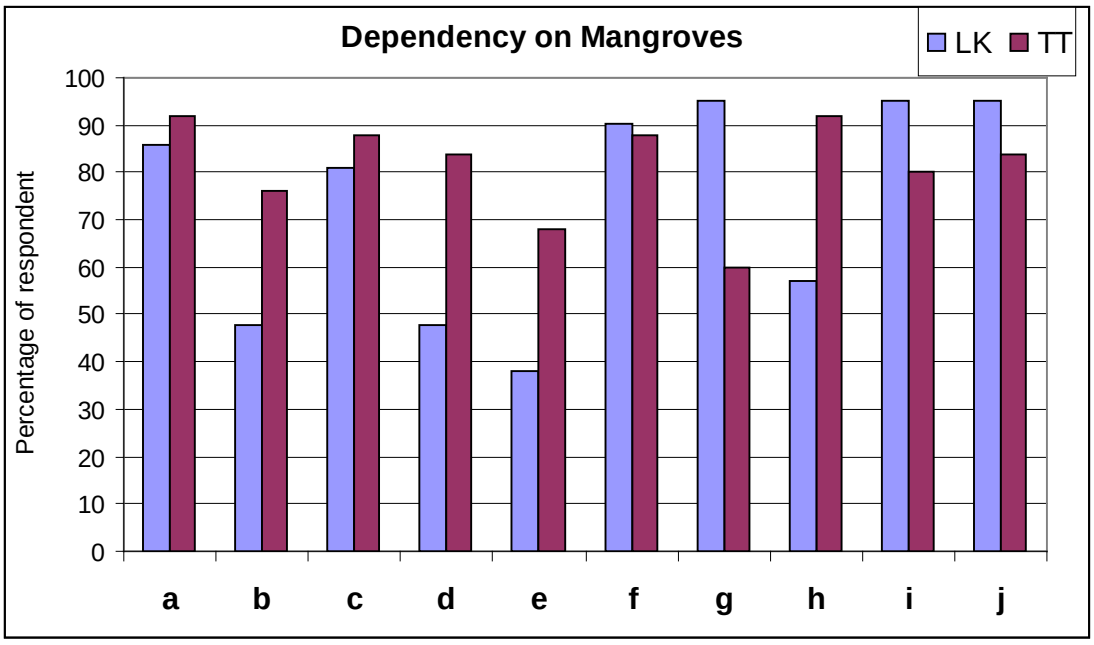


Figure 6.4. Bar graphs comparing the responses from Lamurukung and Tongke-tongke communities over questions A to E on the subject of their dependency on mangroves as described in Table 6.2.

Results of this assessment are presented in Table 6.3. and in the corresponding Figure 6.4. The results show that similar perspectives on community dependency on mangroves were observed in responses to half (five out of ten) of the questions, with three having very similar responses, whereas the responses to the other half of the questions showed somewhat different perspectives. The Lamurukung and Tongke-tongke communities gave different responses to Questions b, d, e, g and h; similar responses to Questions i and j; and very similar responses to Questions a, c and f.

The almost identical responses to Questions a, c and f reveal that communities in both sites recognized the importance of mangroves and their dependence on them. Because of the linkages shown between their livelihood and the mangroves, they thus realized the importance of conserving these resources. However, this assessment also reveals that, although both communities share the same general belief of dependency on mangroves (Questions a and c), their levels of dependency are quite different. Responses to Questions b and e show this. The Tongke-tongke community consistently showed higher levels of dependency on mangroves compared to those exhibited in Lamurukung as the former reported having more-direct dependence on mangroves and procuring more of their food directly from nearby mangrove forests. Nevertheless, both communities recognized the need to protect their mangroves (Question f). The similarities of responses to Questions i and j further enforce the idea that both communities are aspiring towards sustainability.

Dependency can also be detected from how much the community perceives it would feel threatened under a worsening scenario, such as mangroves becoming depleted or extinct in their vicinity. Questions d, g, and h investigated this phenomenon. In addition to the graphs in Figure 6.4, the following quotes provide the nuance of the respondents' thoughts when confronted with such a scenario:

> Of course I am worried if mangroves here will vanish one day. See for yourself - having been mostly cut and cleared, very little remain. Maybe one day they will be completely extinct, and I just have to accept that as a fact. Yet life must go on, right? What else can you do? (HDY, 17-year old male, student, Lamurukung, 18 October 2005)

This is a typical response from respondents in Lamurukung. There was both a sense of regret towards what had happened to their mangroves and acceptance that this process was beyond their control. This resulted in a pessimistic tone when

villagers reflected on the future of their mangroves. Another comment from Lamurukung is presented below.

> I am not thinking of moving, even if the mangroves are gone. Where [should I move] to? I don't have land anywhere else. Besides, my extended families are here, this village is where we belong. If operating [small scale, traditionally-managed] *tambak* becomes infeasible, then I must find something else to do. Anything, as long as it's legal and appropriate. If one day I move out from here, it will not be because of the mangrove depletion, but rather for a better job, just like the many youth here who have gone to Malaysia to become migrant workers. Still, it would not be a permanent move. We will always call here *home*. (ADJ, 40-year old male, Lamurukung, 9 December 2005)

Despite being aware of the deterioration of their mangroves, only around half of the respondents in Lamurukung were thinking about moving to other places. These people emphasized that, even if they eventually did move, it would not be the depletion of the mangroves that forced them to move, but rather they would be more likely to move as a part of efforts to find a better job or living. It seems that the different histories of mangrove growth in these two villages produce differences in the communities' interpretations of their situation. A-more optimistic tone was observed from respondents in Tongke-tongke, who felt that mangroves would continue to flourish in their village, unless some extreme circumstance made the future generations neglect to continue the conservation effort.

> These forests also serve as a reminder, a kind of living monument, to the fact that this village was threatened by an eroded coast, and was almost lost to the sea has it not been the mangroves which save it. I am very confident that these mangroves are here to stay. Unless our grandchildren forget the history and neglect to conserve the mangroves, and that would be a very unfortunate situation. For me, if there is no more mangrove to defend our coastline here, I would surely move. I don't know where to, but who would want to be a victim of storm waves all the time? (ZND, 25-year old male, Tongke-tongke, 20 October 2005).

The last part of this dependency assessment was to observe if the communities recognized the loss of mangroves as a loss to the whole community, and whether they appreciated the need to preserve mangroves for future generations. It appears that, while both communities recognized their as well as future generations' need of mangroves, the community in Lamurukung showed a higher level of concern over this matter. It could be that the bad experience, of losing the mangroves during their

generation, made the people of Lamurukung more concerned with the kind of situation their future generations would face. The following two quotes, in addition to the graphs in Figure 6.4, may provide the nuance of this phenomenon.

> In recent years, government officials from the Forestry Agency came down here quite a few times to talk about the importance of conservation and reforestation of mangroves. It's part of their extension service program. Last year we received 10,000 mangrove seeds for plantation as part of their GRLHN Project. Actually it was not sufficient. They were only enough to plant along a less-than 1 km stretch of our coast. It was so little in comparison to what has been destroyed. Furthermore, not all of the seeds eventually survived - maybe only about half of them. But we appreciate what the government has done to improve our environment, and I asked my people to get involved because this is for our future grandchildren anyway. (ASA, 67-year old male, long-serving village head of Lamurukung, 20 January 2006).

> I hope that our government recognizes the problem we face here with the loss of mangroves and the company abandoning their ponds. Please tell this to them, please replant and regrow our [mangrove] forests. [It is] enough that my generation suffers this. I want my children to have good environment to live in and a better future to look forward to. (MGW, 45-year old female, Lamurukung, 9 December 2005)

To close this section, it can be concluded that both communities recognized their dependence on mangroves. They understood the importance of mangroves to their livelihood, although at different levels of interaction and, therefore, appreciation. Different opinions arose as to how they would respond to a mangrove-depletion threat. This was found to be mainly due to the different histories, levels of success of and feelings of ownership and empowerment over community interactions with mangroves. The Tongke-tongke community, which procures more-direct benefits from mangroves, perceived their relationship with mangroves in a more-positive light, recognizing both their dependency on mangroves and their ability to shape the future of this ecosystem. The Lamurukung community, in contrast, had adopted more of a sense of adaptability to, and acceptance of, mangrove loss, yet they remained more concerned for their future generation's needs of mangroves, possibly due to their sense of disempowerment.

6.5.2. Appreciation of the Ecosystem

Another factor that was found to be useful in explaining community-resource dynamics was a community's level of appreciation of the wider mangrove ecosystem itself. Sustainability of resources, in general, is based on the ability of the local communities to appreciate the ecosystem that produces the resources upon which they rely for their livelihood. However, such appreciation may not occur if there is a lack of awareness regarding the real value of the ecosystem, and it is taken for granted. A series of questions were used in the field interviews to assess if, and how, the communities in both villages appreciated the mangrove ecosystems.

Table 6.4. Results of in-depth interview questions exploring the subject of appreciation of mangrove ecosystems.

APPRECIATION TOWARD THE ECOSYSTEM % of respondents who:		Lamuru Kung	Tongke tongke
a.	Knew two or more different types of mangrove species and their cultural significance	71	88
b.	Were aware about the history of mangroves in their village	90	88
c.	Claimed to have planted mangroves before	81	92
d.	Claimed that more mangroves is better for their village	95	96
e.	Were aware about the threats to their local mangroves	71	84
f.	Were willing to work hard to protect their local mangroves	76	80
g.	Knew the non-monetary value of mangroves (ecological services or cultural significance)	86	88
h.	Thought the value of mangroves goes beyond the market price of a traded wooden log	71	84
i.	Thought that converting mangroves to shrimp farm is economically beneficial and do not necessarily bad for the environment	95	64
j.	Thought there is a close relation between the loss of mangroves and depletion of fish out on the sea	24	60

Table 6.4 and the corresponding Figure 6.5 present the results of this assessment. The results can be broadly grouped into three categories. Both the Lamurukung and Tongke-tongke communities gave very similar responses to Questions b, d, f and g; somewhat similar responses to Questions a, c, e, and h; and markedly different responses on Questions i and j. Both communities conveyed a relatively-high appreciation of the mangrove ecosystem and were aware of the mangroves' history in their respective villages. They knew the cultural significance of

them and were prepared to work for mangrove conservation. Differences between the two communities only occurred with respect to their understanding of mangrove linkages to shrimp-farm environmental impacts, and with respect to mangrove linkages to other ecosystems (Questions i and j).

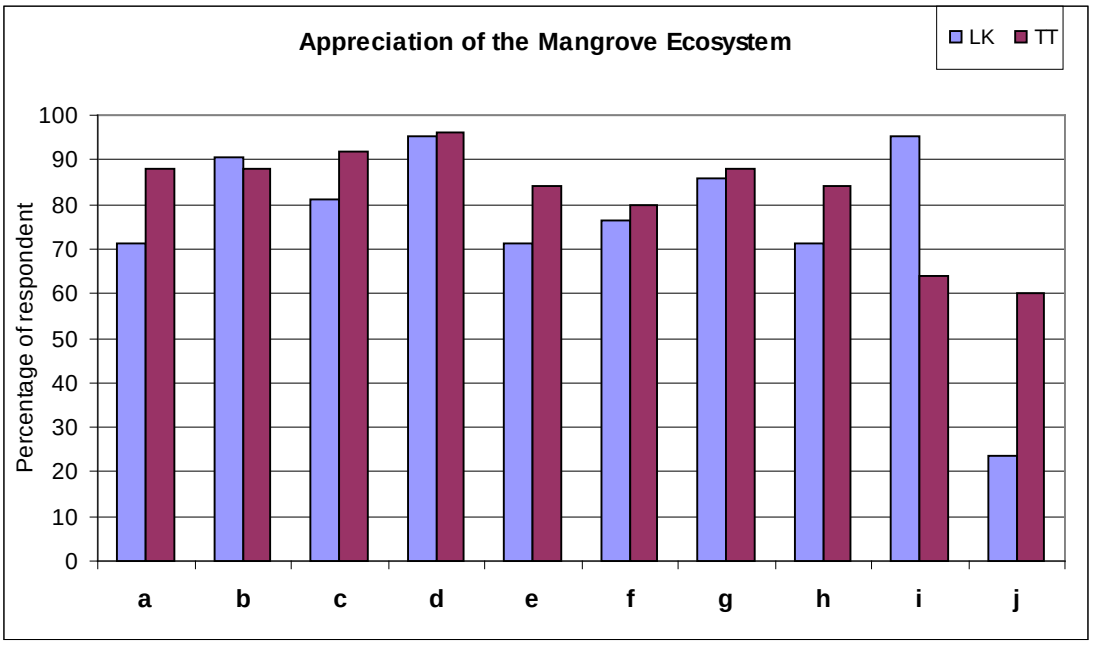


Figure 6.5. Bar graphs comparing the responses from Lamurukung and Tongke-tongke communities over the questions on the subject of their appreciation of mangrove as described in Table 6.4.

Almost identical responses were observed in the two communities regarding their belief that more (rather than less) mangroves were better for their villages, their awareness about the history of mangroves in their respective villages, their knowledge of the non-monetary values of mangroves, and their willingness to work hard in protecting their mangroves. Similarly high responses were also observed from the two communities regarding their knowledge of mangrove types/species, the threats to their local mangroves, and if they had planted mangroves before.

Nevertheless, caution is needed in interpreting these results. A quantitative representation may not provide the level of detail or nuance needed in order to develop a comprehensive understanding of the situation. For example, Question c asked whether the respondent had ever planted mangroves as part of a conservation effort. While the responses received may be sufficient to determine whether any individual conservation efforts had taken place, they stop short of distinguishing the

intensity of involvement of each respondent in the conservation efforts. A respondent may have planted only one or two mangroves just before the interview took place, while on the other hand another respondent may have been involved for many years in mangrove replantation and have planted hundreds or thousands of mangrove trees. Such differences between respondents are not reflected in graphic representations. To address this limitation, further descriptions are provided where necessary. This is where quotes from respondents are used to provide a richer representation of the situation and finer distinctions between variables and parameters addressed by the questions.

The results from questions i and j of this section were specific to each place. This is where apparent differences arose between the two communities. Lamurukung people tended to believe that shrimp farming was beneficial and not necessarily bad for the environment, where as in Tongke-tongke this notion was received with reservations. Question j asked respondents whether or not they could see any relation between the loss of mangroves and the reduction of fish out in the sea. Both communities scored the likelihood of such as relationship as relatively low: 60% in Tongke-tongke and 24% in Lamurukung. I found this quite surprising, as my initial expectation was that these people would have a greater level of ecological knowledge surrounding the importance of mangroves as fish nurseries and better understanding of the complex relations and interdependences that exist between marine and mangrove ecosystems. The following quotes are from two respondents in these two villages.

> I don't think the fish are depleted out there on the sea. The sea will never run out of fish. You just have to be smarter in looking for them, because I think fish are getting smarter at hiding from the fisherman [laughing]. When we cleared the mangroves, that means we drive the fish out of their hiding places into the sea, so actually there are even more fish out there now. (MRM, 38-year old female, Lamurukung, 18 October 2005)

> I think the fish that live in mangrove waters and out in the sea are quite different. Or…, yeah, there maybe some kind of migration between them. I think small fish prefer to hide in the mangrove forests, and will come out to sea when they are bigger or ready to compete with bigger predators. So… yeah, if mangrove is lost, then there are no fish coming out to the sea. (HSB, 27-year old male, Tongke-tongke, 22 January 2006).

In addition to this, having lived with dense mangroves around them, some people in Tongke-tongke had attempted to open-up a limited part of the forest for an

aquaculture venture. Such a venture is locally known as *wanamina*, a type of sylvofishery effort where a bamboo cage (locally called *karamba*) is submerged in water inside the forest, in between the mangrove trees, to grow highly-valued species such as mud crab. Instead of getting rid of the mangroves, this method of aquaculture needs its surrounding mangroves to provide nutrition and a good environment for the organisms under cultivation to grow in. Hence the practice is considered relatively save in terms of mangrove conservation. The following quotes are from a respondent in Lamurukung and another from Tongke-tongke on their perception of viable ventures with mangroves.

> Opening up new *tambak* needs a lot of money, but it promises much more money in return. If I have money, I will open more *tambak*. I've calculated the cost - it is still the most beneficial option. I just have to avoid the mistakes of PT.SAU, and manage them professionally. (BGD, 40-year old male, Lamurukung. 9 December 2005).

> We can not just leave the mangrove as a 'snake house', getting no benefit out of it. *Wanamina* is a good solution to this. That way, we can catch mud crabs fingerlings from the forests, rear them in the *karamba* (culture pen), let them grow until they reach market size and are ready to sell.
> (MTY, 65-year old male, Tongke-tongke, 22 January 2006).

Both villages' communities appreciate mangroves. However, as shown earlier, if given the option of conservation versus potential economic benefit, they tend to choose the economic benefit over resource preservation. Furthermore, both communities agreed that mangroves are important for their livelihood and admit that the value of mangroves is higher than the money paid to buy firewood logs (questions g and h). Such perspectives can be seen further in the comments of the following respondent who worked, in addition to being a fisherman, selling firewood cut from mangrove logs.

> Of course the real value of this (mangrove) firewood is much higher than what we selling it for. But where will we get customers who would be willing to pay such a price? Besides, we are not the only ones who are selling this. There are many other sellers. I won't be able to sell more expensively than those other sellers. I wasn't the one to define the price. (HMK, 36-year old male, fisherman, Tongke-tongke. 24 January 2006).

Like respondent HMK, the following respondent also talked about the elevated value of the resources.

> Let's see this as a gift from god. I went into the wood to collect this firewood, or to catch a few fish or birds, then I went to the market to sell them. I get money from this activity. To survive, one has to work. God has provided us with these rich resources, but you have to get up and do the work to make money to feed yourself. (ARZ, 65-year old male, farmer, Tongke-tongke, 22 January 2006).

In both the quotes above, it can be seen that the respondents feel the pressure of the market forces that create the prices for them. Furthermore, from respondent ARZ it can be implied that he took commodities from common-pool resources but the price he received only represents the labour he performed in bringing the commodities to the market. It appears that the market fails to include the value of the resources in their price tags.

To conclude, this section provides a picture of how the two communities appreciate the mangroves. Differences were observed in terms of how a community believed it could reap the most benefit out of their mangroves. The high percentage of respondents in Lamurukung that supported mangrove conversion versus shrimp farms was mainly due to the absence of alternative models for utilizing the mangroves which promised higher returns. The relatively low levels of recognition of mangrove linkages with other ecosystems was mainly due to the lack of environmental and ecosystem awareness or education in these communities. In general, however, despite the different histories of their local mangroves, both communities were able to appreciate mangroves in some sense, to be knowledgeable enough about their environment to want to conserve this ecosystem, and to have similar aspirations to see lush and dense mangroves in their village.

6.5.3. Aspects of Mangrove Management

The management of mangroves in both villages is the main feature explored in this section. Several different aspects related to the management of this resource were compared, and further interpreted, to provide a good assessment representing the communities' relationship to their adjacent mangrove ecosystems and resources. Table 6.5. and Figure 6.6 provide the responses of the communities in two villages to each of the ten questions asked in in-depth field interviews. The results to these questions can generally be grouped into four categories. Both Lamurukung and Tongke-tongke communities gave very similar responses to Questions h and i; similar responses to

Questions e, g, and j; different responses to Questions c, d, and f; and markedly different responses on Questions a and b.

Table 6.5. Results of interview questions exploring aspects of mangrove management.

ASPECTS OF MANGROVE MANAGEMENT % of respondents who:		Lamuru Kung	Tongke tongke
a.	Claimed to own mangrove trees as part of their assets	24	80
b.	Thought that their local mangrove forest was more dense than before	14	88
c.	Understood the importance of have a green belt: that is, a mangrove lining along the riverbank or coastal edge.	57	84
d.	Believed that it is the government's responsibility to protect and conserve mangroves	95	60
e.	Believed that communities must plant their own mangroves	86	100
f	Distinguished between access to entering a mangrove forest and permission to catch fish there	48	96
g.	Had been a member of, or belonged to, an organization in the village	81	96
h.	Agrees with, or would support, the village acting to regulate access to mangrove forests	90	88
i.	Were willing to work to take care of community mangrove replantation	86	84
j.	If given a chance, would initiate a mangrove conservation group	90	80

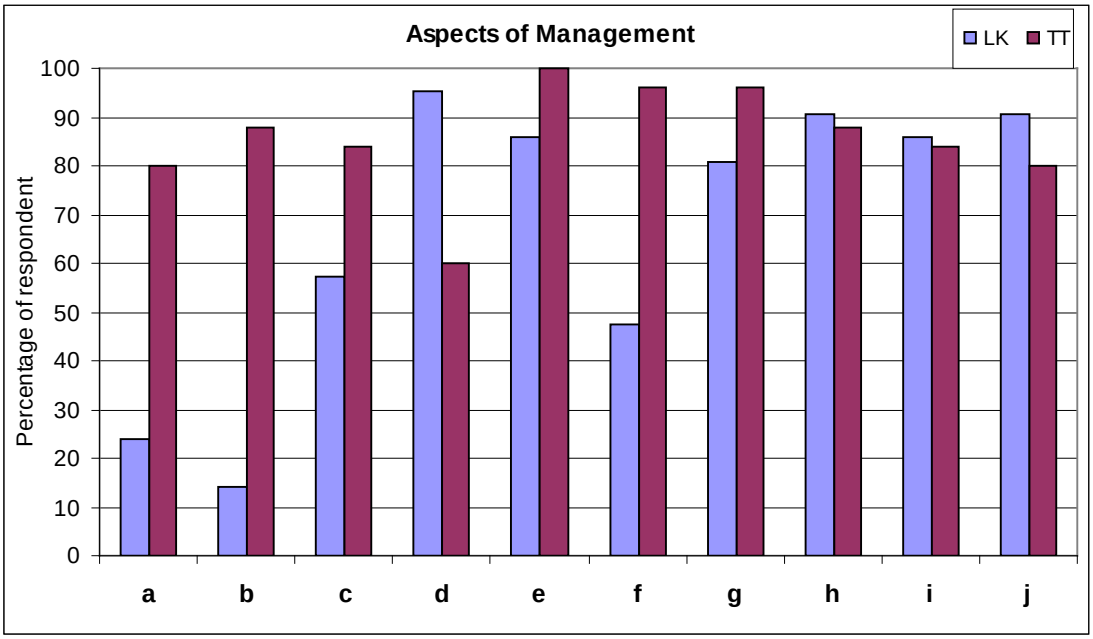


Figure 6.6. Bar graphs comparing the responses from Lamurukung (LK) and Tongke-tongke (TT) communities on the subject of mangrove management. Questions a to j are described in Table 6.5.

Both communities responded almost identically in stating their willingness to conserve mangroves and, therefore, to take care of the community mangrove replantation and to support the village in acting to regulate access to mangrove forests (Questions h and i). Furthermore, the two communities showed similar tendencies in terms of efforts to plant their own mangroves, working together in community organisations and, if needed, were willing to initiate a mangrove conservation group (Questions e, g, and j). The two communities generally believed in the value of working together to improve the quality of their environment, as these responses indicate:

> ACI is a group of mangrove forest owners, hence it is only logical that the management of these mangroves are under its authority. Without ACI, I think this mangrove forest would have been destroyed by human exploitation, because in such a situation, when nobody shows any concern, there may be no rules. (AIJ, 34-year old male, Tongke-tongke, 23 January 2006)

> These natural resources are given by God, and we live around and depend on them. We must maintain them carefully. We have to allow others to enjoy the nature and beauty of the forest, or even conduct research in the mangrove forests, as long as they follow our rules. (ASY, 40-year old female, Tongke-tongke, 22 January 2006)

The differences between the two communities occurred mainly in terms of the technicalities of their conservation programmes, such as their knowledge about 'green belts' and whether or not they could distinguish between the various types of appropriation access (Questions c and f). The response to Question c was very much determined by their experience, a factor which was gauged via Questions a and b. Responses to these two questions are logical consequences of differences in their history, especially in term of mangrove replantation. It was logical that the Tongke-tongke community claimed that their local mangrove forests were greener and more dense than before and, further, that they laid some claim over the mangroves they'd planted as their own community asset. On the other hand, the community in Lamurukung claimed otherwise, that the mangroves were less dense than before and that they did not own them.

The response to Question d was considered crucial as it revealed the paradigm in which the community placed the government's role in the overall conservation effort. Their responses show that for the Lamurukung community, the government

role in environmental conservation is perceived as very much crucial – that is, they wait for the government to initiate conservation measures. On the other hand, the Tongke-tongke community has evolved towards a situation where they are ready to work together with government, or to put themselves forward as a primary partner, in the co-management of their local natural resources.

In conclusion, the results from this section on mangrove management show that, despite differences in their current relationships to mangroves (Question a) and history of relating to mangroves (Question b) between their two villages, both communities have similar aspirations of conserving mangroves (Questions e, g and j), and are eager to work towards conservation efforts (Question h and i).

6.6. FRAMING THE MANGROVE CONVERSION AND CONSERVATION METHODS WITHIN A SUSTAINABLE LIVELIHOOD DISCOURSE

Evaluation of the importance of mangroves for society requires insight into the flow of products and services within the social systems of coastal communities, and into how these are linked and influenced by the markets and related institutions - both domestic and international. Furthermore, it also requires understanding of the linkages involved in the generation of natural products and ecological services, within and between mangroves and other ecosystems. The existence of mangrove forests in the study sites has been shown to be important, as well as advantageous, to local populations, especially for those who live close to these resources. People in both study sites benefitted from mangroves in many ways, but especially through the role of mangroves in protecting their living environment and for obtaining products for their daily needs, such as food, construction, and commercial products.

Findings from this case study offer several resource-management lessons. Comparisons and contrasting features between the two study sites provide important insights for understanding the dynamic inter-relationship between local coastal communities and their surrounding mangrove resources.

Findings from the field assessments indicate that there were four important factors responsible for the mangrove loss in Lamurukung. These were: (1) the absence of institutions or organisations to facilitate the local potential for collective mangrove conservation action and the consequential sense of disempowerment of the locals; (2)

a lack of awareness of the web of mangrove values and their links to local livelihoods; (3) powerful capital of the business interests; and (4) government support for generic business interests and national aims rather than locally-adapted and integrated development goals. The combination of these four factors together facilitated the destruction of natural mangroves in Lamurukung as described in section 6.3.

On the other hand, the key factors identified in the success of the mangrove restoration in Tongke-tongke were as follows: (1) local leadership; (2) the availability of genuine local institutions to resolve perceived stakeholder conflicts and facilitate collective actions; (3) the perception of tangible benefits to the locals of such actions and the accompanying sense of empowerment that this brought; (4) government recognition and support; and (5) specific conservation arrangements and rules being put in place and operationalised. In analysing the sustainability of the mangrove rehabilitation and replantation efforts in Tongke-tongke, several features appeared to be the crucial components, including: clearly defined boundaries for conservation efforts, existence of collective-choice arrangements through the ACI group, the act of self-monitoring by ACI members, and the availability of sanction and conflict resolution mechanism through the Village Act. These types of features were identified by Ostrom (1990) as the general 'institutional features' required for successful, long-lasting management of common pool resources (see Chapter 3, Table 3.3 for a summary of the theoretical background of these features).

Using the background of both villages' experiences, and comparisons of their experiences, this study is able to identify four important factors which are crucial in determining the sustainability of mangroves and the ability of the ecosystem to provide livelihood-sustaining resources to local coastal communities. These are: (1) indigenous or local institutions; (2) collective action from the local community; (3) economic valuations and market interference; and (4) the role of authority.

Despite the efforts of many interested stakeholders, including international agencies and environmental NGOs, and from other local, national and international sectors of society, general habitat loss in the Sulawesi region of Indonesia has been worsening over recent decades. In a report prepared for the Indonesian Ministry of Forestry and Estate Crops, funded by the World Bank, Holmes (2000) shows that between 1985 and 1997 Sulawesi lost 20% of its natural forest cover. Lucas (1998) reports that mangroves in Sulawesi have been reduced from 150,000 ha in the early 1980s to only 23,000 ha by the mid 1990s, and an estimated 78,000 ha of mangroves

have been cleared and converted into *tambak* within the last 25 years (Lucas, 1998). The spectacular growth of shrimp farming over the 1980s and 1990s in Indonesia has been mainly attributed to government and international development agency promotion of the practice (Cowen and Shenton, 1996; Ahmed, 1997). Professor Dr. Ahmad Amiruddin, the former governor of South Sulawesi Province (1982-1992), recalled in his interview with Anton Lucas:

> In a working meeting with all the *bupati* (district heads) in 1987, I got them all to agree to replant mangroves. I flew over the west coast afterwards and could see young mangrove trees being cut down for new *tambak*. Of course there were economic reasons for this. But there were no sanctions then on people who cut down mangroves, because the *udang w indu* (Black Tiger prawn, *Penaeus monodon*) was the *prima donna* in those days (Lucas, 1998, p. 211).

Further assessment revealed that the environmental impacts of shrimp aquaculture do not occur in isolation. These were part of a complex of activities emanating from an industrial-economy paradigm driven by a passion to reap quicker profits. To some extent, the modern development of coastal aquaculture has yielded some economic benefits. However, the same activities represent the mismanagement of competing demands for coastal resources. This represents the case of a trend of increasing conflicts stemming from interest in the adoption of *capital-intensive production pr actices* (Skladany, 1992, p.26) amid the burgeoning growth of population in coastal areas.

Lured by the enormous profits to be made, investors were quick to cash in on the lucrative business. However, the entrepreneurial investments needed to initiate an intensive shrimp culture system are generally beyond reach of traditional tambak farmers. Thus, inherent to this industrial-economy paradigm is the fact that investors tend to be from outside the coastal communities in which development occurs. Their objective is to make a return on their investment, and not necessarily to solve local social problems. Understandably, only those relatively-few who were the investors enjoyed the biggest share of benefits, while large portions of society, particularly the rural poor, became uprooted from their traditional way of life and marginalized into severely degraded environments as illustrated in Lamurukung.

Results clearly show that, from a government point of view there is a real need to re-evaluate the cash-crop, export-oriented policy of shrimp culture development. What happened along the coast of Java in early 1990s and then in outer-island coastal

areas such as in Sulawesi and, more precisely, in Lamurukung by 2000, should be a chance to reflect on the direction of aquaculture policy in Indonesia and, more-broadly, in developing countries. For example, there was a marked shift from extensive but low-intensity and traditionally-informed aquaculture production of food (mixed-milkfish) largely for the domestic market to the 'more lucrative' export-oriented, intensive, non-traditional crop (shrimp-alone) production. The result has been the loss, not only of a valuable local protein source (milkfish) linked to the sustainable livelihood of coastal communities but also, of valuable wetlands amid the conversion into, or salinisation by, shrimp ponds - both results being detrimental to the goal of national food security and self-sufficiency.

From the entrepreneurial investor's point of view, hindsight indicates that the intensive shrimp culture system is not necessarily the most beneficial long-term option either. It is a highly capitalized venture with high risks and low employment-generation potential. Several studies cited by Bailey (1997) revealed that, with prudent management, a semi-intensive culture system has a better rate of return on the investment. This is not factoring in all the other 'externalities' such as environmental degradation, which would make the intensive *tambak* system fare even worse in comparison. The conversion of coastal ecosystems into monoculture production areas can have disastrous long-term effects (Poernomo and Cholik, 1996; Stevenson, 1999; Paez-Osuna, 2001).

Figure 6.7 shows that the lifespan of an intensive shrimp *tambak* is between five to eight years. That is exactly what happened to PT.SAU in Lamurukung. Many other intensive *tambak* companies in Indonesia have been forced to shut down after less than five years of operation due to being overwhelmed by their own self-generated pollution (Dahuri, 2003). Once such farms are abandoned, it becomes expensive and difficult, if not impossible, to rehabilitate the land for any other purpose such as traditional farming or the replenishment of destroyed mangrove forests (Stevenson, 1999; Sugunnasil and Sathirathai, 2004). This rehabilitation hurdle is, in itself, an immense ecological, social and economic problem in places like Lamurukung, and throughout much of coastal Indonesia today as a legacy of the 1990s initiatives to promote the industrial-economy paradigm.

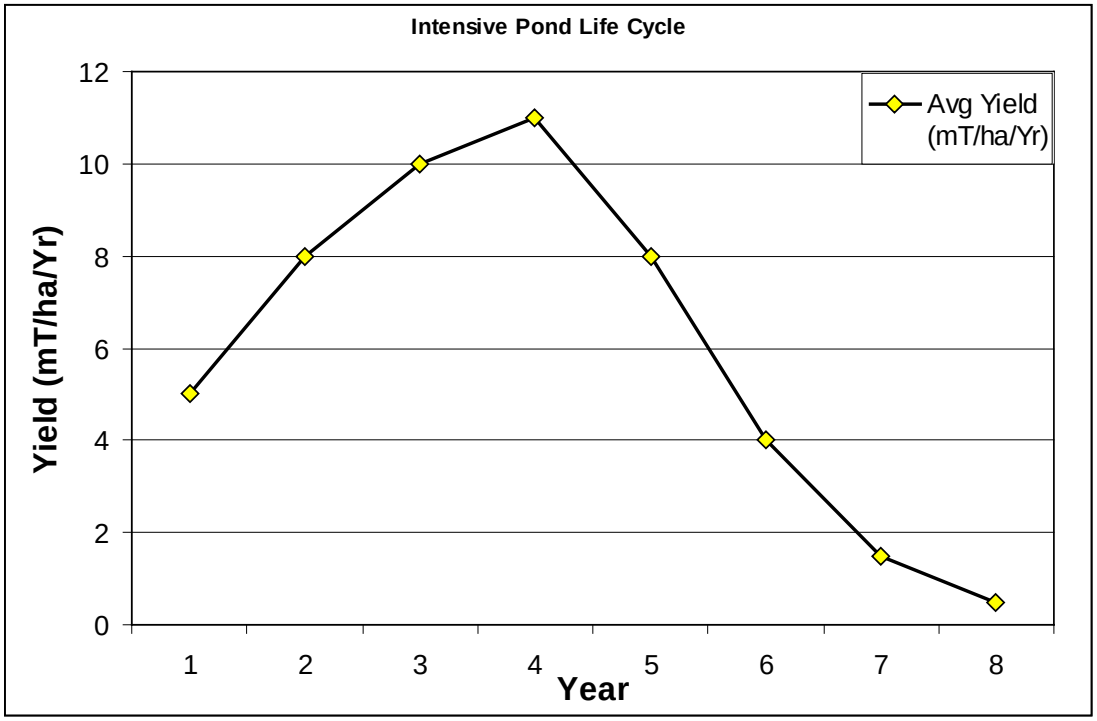


Figure 6.7. Typical productivity life span of intensive *tambak* (Poernomo and Cholik, 1996).

There is now concern in Indonesia that the intensive shrimp-farming industry is practicing methods similar those labelled 'slash and burn' in traditional agriculture. However, since the approach is entirely different, the term 'hit and run' seems more appropriate for this type of shrimp-farm *modus operandi*. Since they are conducted at a large industrial scale, such *tambak* operations could also be labelled as 'footloose industry', a term indicating the ability of the industry to move flexibly, to different geographical locations within Indonesia, without being bound to any particular place. This flexible movement at the scale of different coastal *tambak* localities is, in another sense, inextricably bound to 'place' at the national scale since the lack of restrictions on developers continuing to move on, to new sites, after they have degraded old ones was a product of the centralised support for their industry and lack of effective environmental and resource protection agencies operating during the 1990s shrimp-farm boom. Again, Figure 6.7 may explain how the 'hit and run' intensive *tambak* trend came to be an ongoing, entrenched reality. Soon after learning that intensively-cultivated ponds had production lifetime of approximately only five to seven years, becoming unusable after that, the entrepreneurs of this industry changed their focus from buying to renting the land needed for building their shrimp-farm facilities.

Renting the land became a more viable economic option as opposed to buying and investing in it and there were no regulations to prevent this since all support was focussed on creating an industrial economy and bringing development to the regions without analysis of externalities. Such accounting practices rely on ignoring the local externalities which occur during the production stage and last long after the production has stopped. As such, these practices are perhaps also intrinsically linked to the separation of locality and local community from successful investors and government development imperatives and ideals.

6.7. CONCLUSION

Mangroves have important roles and significant meanings for local coastal communities in Sulawesi. Local people have a high dependency on the products and services provided by mangrove ecosystems. This research reveals the existence of several important features of the dynamic relationships between coastal communities and the mangroves in their vicinity, as well as of the relationships amongst different mangrove-resource stakeholders, which together can determine the sustainability of these relations.

The mangrove case study discussed in this chapter revealed that, in the case of Sulawesi over the last few decades, top-down approaches to resource and environmental management generated negative impacts on the mangroves and, subsequently, on the local community, whereas bottom-up approaches produced considerable success. Importantly, the latter also induced confidence in the coastal community and a strong appreciation of the mangrove ecosystems and their ability to conserve them. This case study revealed contrasting pictures of mangrove growth and ecosystem changes in Lamurukung Village *vis a vis* Tongke-tongke Village, including effects on the communities of each respective village. On the one hand, the Lamurukung community has had to endure the loss of the majority of the mangroves in its vicinity, due to the failure of a top-down regime of mangrove-wetland habitat management policies, eventually having to deal with a series of socio-economic and ecological consequences of the failed venture. On the other hand, the Tongke-tongke community story represents a bottom-up regime of mangrove management, where a community-initiated mangrove replantation and conservation effort has proved able to save their village from the threat of shoreline erosion.

The snapshots produced in this study have also shown that, even with their markedly different histories of mangrove development and management success, the communities from both Lamurukung and Tongke-tongke villages appear to have similar aspirations and perspectives about the need for mangrove conservation. Both communities have similar perceptions of the state of their *dependency on* and *appreciation of* mangrove ecosystems. Differences were, however, detected in the communities' perceptions of several *management as pects* of mangroves. The differences were mainly regarding how they perceived the roles of government versus local community in managing mangroves. The starkly different perspectives observed meant that that the Tongke-tongke people were ready for community-based or a co-management types of mangrove management, whereas the Lamurukung people tended to wait for outside initiatives to occur, even expecting orders to come from government with regard how their local mangrove ecosystems should be managed.

The Tongke-tongke community has seen the ultimate benefit of mangrove replantation by having their village, not only saved from annihilation by coastal erosion but also, strengthened in terms of the physical site as well as in terms of the villagers gaining further fiscal benefits from trading the many forest products from the mangroves. The main motivation, therefore, has been changed from rehabilitation of the protective function to the generation of income from their mangrove forests. In contrast, the local community was disempowered when confronted with the large capital of a large company with strong backup from both local and national government in Lamurukung.

Results derived from this mangrove case study also show that central and local government policies can have unintended impacts if it they are not sensitive to local communities, environments, and industrial externalities. In this case, the government policy to accelerate foreign exchange from shrimp exports had negative impacts on local food security in direct opposition to any development imperatives. While one of the main reasons for developing the coastal aquaculture industry in Indonesia was to enhance communities' with local food reliance by increasing the available sources and rates of production of protein and income to buy market food in coastal society, intensive *tambaks* producing export crops such as shrimp could hardly be considered a part of this food security.

Destruction of the mangroves observed at the study sites was not commenced by the initiative of the local community, but rather it was performed due to the

initiatives of big business interests with connections to government at many different levels (district, province and national). Such an interest was promoted and backed by international donor (loan) agencies. In such situations, the community was powerless in the face of the big business with backing from government apparatuses.

Finally, although both communities appreciate their mangrove very much, when given the option between reaping conservation or potential economic benefits, they tended to choose the economic benefits over resource preservation. Such a tendency, however, was present at quite different degrees depending on the community's awareness of conservation issues and the benefits that they comprehended could result from mangrove conservation. Nevertheless, this tendency has shown that the market holds an important role in defining the community's perceptions of, and aspirations toward, a resource. Indeed, the market has an important role to play in the sustainability of these resources. The next chapter of this thesis will further analyse this 'role of the market' issue. Chapter 7 will further-analyse and provide a synthesis of the dynamic inter-relations existing within and between local communities, their natural resources, and the market, and the role of these relations in defining the sustainability of the resources and local livelihoods.

PART 3: SYNTHESIS AND CONCEPTUALISATION

CHAPTER VII. SYNTHESIS OF THE CASE STUDIES: LINKING RESOURCES, MARKETS AND COASTAL COMMUNITIES

7.1. INTRODUCTION

The third and final part of this thesis consists of two chapters. Chapter Seven presents a synthesis and discussion of the coral reef and mangrove case study research findings from previous chapters. This is followed in Chapter Eight by the conceptualisation of a more sustainable management framework for tropical coastal resources in the developing country setting of Indonesia, based on findings from the research sites as well as an examination of the major conclusions and limitations of this study.

The synthesis presented in this chapter is drawn from the two case studies presented in previous chapters. The synthesis is based on the following research questions, which have previously been introduced in chapter 1: *Do the challenges to conservation differ between coral reef and mangrove ecosystems, and what works in the conservation of these ecosystems by local communities?, What are the main components of resource-utilisation, and how do they relate to livelihoods?,* and *How do top-down and bottom-up approaches to achieving sustainable development differ?*

Analyses presented in this chapter draw on lessons from case studies conducted in the Sulawesi Region where it is particularly problematic to apply a coastal resource management system like those outlined in Chapter 2, such as the ICM regime. The synthesis has been based on the analytical framework set forth in Chapter 4, the methodology, and the theory introduced in earlier chapters. The three major theoretical prongs of sustainability have been blended with other components found to be present in the field, including community and institutional sustainability, to build a picture which closely resembles the dynamics of coastal resource uses in Sulawesi. The interplay among these components is used as the sustainability criteria from

which to assess the prospect of the resources being able to sustain a community's livelihood. Figure 3.2 provides a summary of the analytical framework used.

The lessons drawn from the case studies are analysed further than in previous chapters within the wider context of resource management. The dynamic links that exist between the resource, market and community livelihood are assessed. In analysing these links, attention is given to understanding the interplay between the economic interests and power relationships that exist through patron-client relationships, collusive networks and capital funding systems. The patterns of interaction between the three components observed in the field (resource, market, and livelihood) are identified and analysed. Then the field observations and analyses are interpreted from a theoretical perspective. The last part of this chapter discusses challenges to coastal resource sustainability in developing countries, by looking at the experience of sustainability at three different levels: local, national and global, including how the issues of coral reef and mangrove sustainability are treated at these levels.

7.2. LESSONS LEARNED FROM THE CORAL REEF CASE STUDY

As introduced in earlier chapters, especially in Chapter 5, coral reefs in Indonesia are in a dire state with their ecological and resource sustainability hanging in the balance. It has proved to be no easy task for the Indonesian government to manage its massive marine resources, including the approximately 85,700 km^2 coral reef area (14% of the world's total coral reef area), which is considered to be the site of the world's highest biodiversity of coral reefs (Nontji, 2002, p.18). Despite efforts to eliminate destructive fishing practices and improve coral reef management, such as the currently on-going World Bank funded COREMAP Project and other so-called capacity-building programs, the state of coral reefs in Indonesia remains under threat from anthropogenic disturbances and is continuously deteriorating (Antunes, 2005; COREMAP, 2007).

Chapter 5 details the findings from the field investigations. Analysis of these findings reveals that the causes of DFP and reasons for its persistence in the Sulawesi region come from wide-ranging factors involving many types of stakeholders. These factors can be classified into three categories: institutional failures, market failures, and livelihood and resource aspects.

The institutional failures are aspects where the state (in this case the government) fails to ensure the proper functioning of the institutional arrangements that are in place for sustainable use of coral reefs, including the legal framework, organisational structures and relevant stakeholders positions. This failure includes: problems in law enforcement and compliance such as corruption and lack of enforcement; the lack of government capacity to ensure proper management and law enforcement; problems with the existing institutional arrangements for reef management such as the overlapping responsibility and authorities over the reefs amongst vertical as well as horizontal governmental departments and the lack of coordination thereof. This situation eventually induces a breakdown in the community structure and traditional norms protecting reef resources.

The market failures are situations where the market mechanisms fail to include the genuine cost of appropriating the resources and, therefore, are unable to provide an equitable spread of costs and benefits reflecting a fair transaction. Aspect of this situation include the widely-open domestic as well as export markets where there exists a high demand for seafood and relatively unsaturated markets for fresh reef fish as well as for ornamental fish. Other aspects are the discrepancy between the risks or disincentives and benefits or economic incentives of performing DFP (i.e. the practice is relatively low-risk but yields high short-term benefits) as well as the concentration of economic gains with the DFP practitioners but spread of costs (including reef degradation) amongst the wider community that is dependent on reef resources.

Finally, the livelihood and resource aspects deal with the fact that interactions between livelihood and resources are not well balanced or, in other words, the resources upon which the local community rely for their livelihood fail to guarantee a sustainable livelihood. This aspect includes: the lack of alternative fishing methods with similar efficiencies, and the fact that there is a high level of poverty amongst coastal communities which encourages people to use the most-efficient and cheapest methods of fishing available. In the end such a situation increases the reef degradation, making fish resources even scarcer. Such an increasing scarcity sets up a vicious cycle where people are more likely to choose DFP for its efficiency.

The combination of the above root causes of DFP has encouraged much opportunistic behaviour amongst the several types of actors in the DFP system: the capital owners, security officers, market operators and even the costumers. Such opportunistic behaviours can be observed amongst these people as follows: capital

owners who take advantage of the readily-available low-wage labour from individuals who are willing to do anything to earn cash due to poverty; security officers who are willing to collude for their personal financial gain; market operators who take advantage of the highly-unsaturated fish market (i.e. high demand), readily available commodities (fish), and undifferentiated demand between DFP and other non-DFP products. Last but not least, local and international consumers take advantage of the readily-available, fresh, cheap and often exotic foods produced from DFP.

Findings from the field show that the intensity of the resource extraction is determined, to a large extent, by market pressures. The marketing network dictates literally what type of fish is to be caught, where, how and how much. This is mainly because of the power relation embedded in the *Ponggawa-Sawi* system, a patron-client system that defines the resource pattern. When corrupt governance is added into this equation, then a collusive network is produced.

Having understood the many facets of DFP, it is clear that activities that lead to coral reef destruction do not stand alone. Ways of addressing the problems must, therefore, pay attention to the root causes which create the problems. It is important to understand the inter-relating factors that operate and define the occurrence, and especially persistence, of DFP. Building on from the identification of the root causes, it appears that there are three important aspects to consider in addressing DFP: the socio-economic state of the society, the state of governance of the resource and geographical aspects of the resource. Based on this approach, it can further be surmised that the DFP has its roots in three conditions: poverty, lack of law enforcement and conducive locations. These three factors are basic conditions for DFP to occur.

1. Poverty

Many of the resource utilization problems observed in this study found their roots in chronic poverty, a factor which then gives rise to unsustainable modes of resource exploitation. Although not all actors involved in DFP are poor, in fact the *ponggawa* are among the richest members of society, a state of poverty is needed to allow exploitation of individuals to be willing to assume the work as field operators. Indeed, the respondents involved as frontline field operators in DFP admitted that their situation was due to the lack of welfare and alternative means of livelihood. This situation has been discussed previously in Chapter 5.

2. Lack of law enforcement

The immediate official reason given by those in authority in Indonesia for the persistence of DFP is insufficient facilities to perform surveillance. Weaknesses in the surveillance system due to insufficient resources has been the *Achilles heel* of those wishing to implement sufficient management measures in most marine areas in Indonesia. Those with intentions to conduct illegal activities in marine areas find the lack of surveillance capacity provides them with a safe haven in which to conduct their exploitative operations. Nevertheless, this somewhat apologetic reasoning given by the authorities responsible for surveillance avoids admitting or addressing the reality that the persistence of DFP is due to a collusive network involving the very security people that should be preventing DFP operations.

The relationship between corruption and illegal activities such as DFP has been widely recognised, for several years, in reports such as Barber and Talbott (2003), Obidzinski (2004), and Prasetiamartati (2007). Some management system lessons can be drawn from examining the evolution of authority into a corrupt participant in the collusive network of DFP. Several factors have been identified as having contributed to this widespread corruption: remoteness, complex legal landscapes, and the low pay rates of government officials. DFP sites are remote from policy-making centres. Therefore, field officers have discretionary powers and wide-open opportunities to exercise their authority in terms of corrupt behaviour. The legal landscape of the coastal-marine environment in Indonesia is complex. Government tends to generate many regulations, many of which overlap, the result of which is that they merely end up as 'paper tigers'. Such a proliferation of regulations does, however, create opportunities for government officers and personnel to wield their authority in a corrupt manner. Moreover, government officials in developing countries such as Indonesia have salaries which are low relative to their level of authority or responsibility over the control of high-value products. The incentives for corruption are therefore immense.

Where a culture of corruption is widespread, as in Indonesia, straightforward strategies such as increasing patrolling budgets or simply raising officers' salaries without further training and shifts in the culture of organisations are unlikely to be

effective. It will take a concerted effort, addressing several issues at once, and require strong commitment from many different levels of society to alleviate the problems simultaneously. Bardhan (1997) argues that where corruption is widespread, a critical mass of opportunistic individuals will have to be convinced over a long-enough period of time that corruption no longer pays. Hence, the strategies have to be sustained over the long term and are likely to require broader reforms. Bardhan (1997) further argues that a strong government, capable of enforcing laws and property rights, is more important for reducing corruption than economic or political competition. Thus, measures such as the opening up of export markets, or introducing a free market model, and even the introduction of democracy alone, do not automatically translate into clean governance. In fact, there is a high incidence of corruption during political transitions when underdeveloped institutions take charge. This fits very well with the situation in Indonesia (Sullivan, 2000), where the country has just been starting to experiment with democracy and neo-liberal free-markets.

3. Conducive location

The geographical context is an important feature of DFP. The minimum surveillance capacity of government authorities is tested even further by the fact that many of the high-biodiversity reef areas are located remotely from marine management activity bases and other supporting institutions. Such a situation makes it almost impossible to implement effective management measures such as regular surveillance or other conservation efforts.

A vitally important feature of DFP is that the activities are closely intertwined with market dynamics. As indicated in Chapter 5, DFP field operators do not always come from the local community and the marketing of products is not done locally either. DFP operations are very mobile, progressive and very much reflect the agility of the market. Therefore, DFP do not occur in all places at all times but rather they occur only where and when they met with ‘market feasibility’ criteria.

Various impacts were observed from the nine study sites examined for the coral reefs case study. Such impacts ranged from a reduction or loss of reef biodiversity at all sites, to the human fatality that was a direct impact of the exacerbated horizontal conflicts observed at Site 5 between inter-island communities. Such conflict may also arise from the fact that the habitat destruction caused by DFP,

which induces a loss of biodiversity, in fact increased the possibility for Malthusian overfishing. When people lose their resources, this contributes directly to worsening poverty, which then results in government revenue losses. Further compounding the situation, when DFP indirectly results in reduced government revenue, this revenue might have otherwise been made available for poverty reduction programs. Lastly, DFP introduces distortions into the market of fish commodities and other derivatives.

Finally, from the evidence observed in the field it can be concluded that if DFP cannot be stopped and the coral reefs continue to decline, the following outcomes will likely occur as consequence: (1) physical impacts - further damage to reef structures will cause coastal erosion; (2) social impacts - continued DFP will be the basis for further conflicts over resource utilization that will, in turn, result in more apathy amongst communities towards conservation efforts; (3) political impacts – continued DFP will reflect the ineffectiveness of the authorities, which may provoke anarchy in the way resources are being utilized; and (4) ecological impacts – continued DFP will induce resource overexploitation, instigating further losses of biodiversity. In the end, all these four types of impact will eventually result in a situation where the species which are regarded as resources becoming extinct and therefore unavailable for use by future generations.

Dahuri (2003, p. 332) argues that "DFP is a phenomenon of the limited economic options faced by coastal communities". While this statement may be correct, it does not illustrate the whole picture. Field findings of this research reveal that underneath the layer of the field operators, at the *sawi* and up to the 'small-*ponggawa*' levels, there is a complex network of interests played at different levels. So complex is the entire picture of this collusive network that it might go all the way to include seafood consumers in other countries around the world.

7.3. LESSONS LEARNED FROM THE MANGROVES CASE STUDY

In many countries, where intensive shrimp farming has become a booming aquaculture industry, it has faced considerable criticism due to the environmental and socio-economic problems generated by this activity (Ronnback, 2001; Armitage, 2002; Barbier and Cox, 2004; Adger *et al* ., 2005, and Primavera, 2006). The environmental issues mainly spring from the fact that shrimp ponds are mainly built

by converting mangrove forests, whereas the socio-economic problems are due to the fact that, in the final analysis, shrimp aquaculture does not contribute to the local food security.

Social and economic arguments for mangrove conservation are based on the role of these forests in providing well-being to those locals that are dependent on their products, and their ecological services. The functions and services provided by mangroves, and wetlands in general, have important values (Ruitenbeek, 1994). Yet these values are often ignored in the on going process of mangrove conversion. In spite of all the news about the mangrove forests lost, there are areas where mangroves have actually increased, owing to reforestation efforts which have been mainly initiated by the state. However, such initiatives have been shown to be most successful when the local community is involved and, in fact, takes a significant or lead role. With few exceptions, these successes and the associated gain in ecological and local-community attributes have been little publicised, receiving what can only be described as minimum attention.

In the study areas, Lamurukung and Tongke-tongke, local use (direct and indirect) of mangrove forest resources is varied and significant. In Tongke-tongke, where the locals have been successfully planting mangroves, community members have identified a range of economically-important products associated with intact mangrove ecosystems that can be harvested and utilised throughout the year, many of which provide important sources of food and household income.

On the other hand, the Lamurukung community is able to identify the observed impact of their mangrove losses, such as: loss of biodiversity, habitat degradation, loss of a food source for the locals which may extend to a loss of livelihood, and salt water intrusion into the aquifer. In the case of Lamurukung, the situation was worsened by the fact that the ground water table first dropped as a result of excessive use of fresh water by the shrimp farm operation. This situation induced and accelerated the intrusion of saltwater into the aquifer system.

On the issue of mangrove conservation, several lessons to be learned can be drawn from the Tongke-tongke community experiences. It should be noted that there were several factors that drove the success of the mangrove reclamation: the tangible benefits of mangroves; a good understanding of the ecological values and services of mangroves; the availability of institutional mechanisms to support conservation

efforts; and finally the State or authority's preference for supporting conservation instead of conversion.

On the other hand, both the Lamurukung and Tongke-tongke communities understood that there were several factors which drive mangrove loss. The factors identified were: a lack of awareness of the real value of the mangroves; excessive extraction of mangroves for firewood; ineffective regulations to protect the mangroves; a lack of efforts to enforce the existing regulations; the conversion of mangrove habitat to other uses, especially for shrimp farming; and the inability of the community to mobilise or organise themselves to conserve the mangroves. Behind these factors, however, there is a development paradigm which dictates the generally-held perception of mangroves, where the real values of mangroves were devalued on the face of tradable commodities and policy narratives that supported cash crops. The realisation of such world views can be seen in a powerful collusion between shrimp farming capital interests and government policy, which supported the mangrove conversion into shrimp ponds in order to generate foreign exchange. In the face of this powerful collusion, the community found itself powerless and unable to defend the original mangrove ecosystem.

Large-scale mangrove destruction has been an impact of large-scale capital operations, a pattern which has proved very powerful in comparison to the communities' ability to mobilize and implement local conservation initiatives. Hence, conservation at the local level has to face the challenges of market-driven resource extraction at a global scale. In this case, it is easy to see why the local community in Lamurukung had to loose their mangrove forests and give way to market-driven capital.

An important finding from this mangrove case study is the comparison between the top-down policies on mangroves in Lamurukung and the bottom-up initiatives of the local community in Tongke-tongke to conserve the mangroves. As indicated in Chapter 6, there are four factors identified as being crucial in determining the sustainability of mangroves: (1) the role of indigenous or local institutions, (2) collective action from the local community, (3) the role of authority, and (4) the exogenous attributes such as market interference or the economic valuation of resource exchanges. The role of community was found to be crucial. However the ability of this local community to mobilize themselves, to participate and engage effectively in mangrove conservation measures, was very much determined by the

availability of the indigenous local institution and the role that this institution played. Further down, however, the authorities' role played an important part in keeping the conservation efforts on track and from otherwise losing its momentum. At this stage, the outside interference significantly influenced the outcome.

Using the theoretical approaches outlined in Chapter Three to evaluate the above factors, three lessons can be drawn from this case study. These lessons can be used as basic approaches in investigating other similar settings of natural resource utilisation to examine their sustainability. The three lessons address the following aspects: (1) access for appropriation, (2) types of property rights, and (3) dynamic interchanges between the top-down and bottom-up approaches to resource management.

Access for appropriation deals with the ability of local communities to recognise that different rights exist toward natural resources (Platteau, 2000). The fact that the resource is within their vicinity can generate particular rights for them which they may not have previously recognised. It is important to communicate these types of access for appropriation so that the main stakeholders, especially the locals, can understand their rights as well as their responsibilities toward the resource. Therefore the second lesson, regarding the types of property rights, becomes important. Government recognition of local community's rights toward their local resources would help improve the level of regulatory compliance. This can be seen from the example of Tongke-tongke, whereas loss of rights and access to resources as seen in Lamurukung created apathy among the locals. Lastly, cooperation between the local bottom-up initiatives and government recognition and support from the government are important ingredients in achieving a sustainable resource as shown in Tongke-tongke. Such cooperation must be based on mutual respect and appreciation toward each other's significant roles and contributions.

The findings of this case study, and lessons drawn from them, are expected to contribute to the state of knowledge in natural resource management settings, and to enhance the level of the debate concerning mangrove utilization practices. Findings from this case study challenge the assumptions generally employed to promote the government's cash crop policies. They also challenge the idea of development which is often purported to be behind every effort to reduce the non-monetary values of the services provided by mangrove ecosystems. It has been suggested in this thesis that more attention needs to be given to the long-term benefits of resource ecosystems.

This would enable the identification of appropriate roles for each of the various mangrove stakeholders so that their use of these systems could be sustainable. The lessons drawn from this study improve our understanding of institutional diversity. It was suggested that the differences in socio-economic circumstances and political contexts between the study sites generated different perceptions and ideas of mangrove utilizations and conservation efforts. Therefore, the lessons learned are potentially useful in designing future potential co-management regimes, involving top-down as well as bottom-up approaches. Finally, the lessons warn that modern developmental initiatives must be carefully monitored to ensure that they do not undermine the social and economic well-being of local communities.

7.4. LINKING MARKET DYNAMICS, RESOURCE USE AND COASTAL COMMUNITIES' LIVELIHOOD

Both the coral reef and mangrove case studies showcased how relations between the market, capital and power can result in different patterns of resource use and exploitation. One broad difference between the two case studies was that in coral reef fishing situations the capital is usually embedded within the local communities whereas in the case of mangrove conversion the capital comes in to an area from outside or above the level of the community and remains predominantly external to that community. Results show that DFP persist in the coral reef case study since there is no real separation between the community and capital. Not only that, the capital system takes a *free ri de* from traditional systems by absorbing the established *Ponggawa-Sawi* system, a patron-client relationship which traditionally existed within the community, to become the local resource utilisation system. In the mangrove case study it was easy for the local community to identify 'other' (elements external to the community) and, therefore, easier to have a 'common enemy' of outsider when things started going wrong. In contrast, people in the islands where DFP operators reside cannot identify 'outsiders' who can be potentially labelled as a 'common enemy' when the reefs are degraded, since these operators are their family, their neighbours and their community.

The detailed dynamics operating within the individual communities studied in the two different case studies showed a multitude of variation. As such it is not easy to find a common ground for simple, generalised interpretations among the communities

in all eleven sites – and their differences can inform us about their different resource outcomes. However, patterns do emerge when the communities are grouped into categories – the structured description below provides a generalised picture to synthesise the findings observed in different groups of communities, leading to a general representation of the resource problems faced by these communities. The next part of this section addresses the following three questions:

1) What is range of the communities' perceptions toward their local resource use, and therefore, their livelihood;

2) How do these perceptions fit into the identification of the key issues of resource problems; and

3) What is the pattern of interactions observed among the main stakeholders?

Local coastal communities' perceptions of resource use and their livelihoods

The traditional ecological knowledge and wisdom existing within these communities can be seen as a crystallized record of experiences of their forefathers in interacting with nature over a relatively long time. Therefore, a good understanding of the communities' perception of the coastal resources is an important factor in designing an effective intervention programme, a project design, and policies for coastal resource management. Observations in the field and data interpretation from interviews reveal that a series of indicative aspects may be identified to help describe the local communities' perceptions of coastal resources in the Sulawesi Region.

a. *The coastal resource conditions are generally distressing.* Local people generally responded to the question about the adjacent mangrove or coral reef conditions on which their livelihood depended by describing it as 'damaged or deteriorating' with the damage becoming worse.

b. *Fish stocks are declining and, as a consequence, fishing trips need to be made over greater distances, for longer durations and come at a higher cost.* In effect, today's catch requires more complex gear and more time than in the past. Local people interviewed understood that environmental changes and habitat alteration have been the primary reasons for fish decline. Although they could not describe the precise cause-and-effect mechanisms, the local people recognized that changes in biological and environmental conditions had driven up the cost of their fishing.

c. *Fishing as a livelihood does not promise an adequate income.* Although they cannot pinpoint the exact figure, the fishermen felt that changes to their daily expenses over time meant that they had less disposable income. Intuitively, they do not want their children to become fishermen.

d. *Present threats to the environment are quite different to those of former years.* A few decades ago people could rely on 'gifts from nature', natural disasters being the only things that made significant changes to their environment. Nowadays, the influence of natural processes have been superseded by the many human-induced influences and there is a strong sense amongst community members of serious anthropogenic threats such as water pollution, mangrove clearing, and reef blasting.

e. *The communities in the study sites generally realized the need for assistance from, and partnership with, external parties in order to maintain the sustainability of their environment and to improve their livelihood.*

f. *Threats to the sustainability of coastal resources and poverty among most coastal communities are the two main problems for which governments should be accountable.* For example, in the case of destructive fishing, local communities suggested that the key to solving this problem was consistent law enforcement. The locals also knew that the government had not been enforcing the law consistently and they were able to recognise that a corrupt system was at work.

g. *The local community realized that they needed to improve and enhance their knowledge in order to manage the coastal resources so that those resources could provide them with a sustainable livelihood.*

Key issues

Each community has its own history of dealing, and interacting, with their adjacent resources and environment. While every community may have different experiences of managing coastal resources, the reaction to such experience can differ even within the community. However, there are several issues that persistently occur and may be drawn together as a generalised feature which represents the key issues

faced in the Sulawesi region as a whole. The following are the primary issues identified from this assessment, and can broadly be described as follows:

1. The root cause of the coastal resource destruction is closely intertwined with the poverty of coastal communities. This was found to be especially true when considering the *sawi*, the fishing boat crews who can only offer their labour in order to earn a living and survive since they have no other assets. In the face of poverty, the communities studied often lacked alternatives to livelihoods based on exploiting their adjacent resources, which were primarily coral reefs and mangroves.

2. Coastal resource destruction continuously occurs because of the seemingly unstoppable destructive-fishing activities. Certain species in certain areas around the Sulawesi region have reached a condition of being overfished. Several fishing grounds, which had long been known for their dense fish stocks until a few years ago, are now laid bare and stripped of fish. This depletion is a new factor for communities and one which contrasts their experience of many years of good fishing spots.

3. The lack of alternative income generation methods available to small island communities is likely to increase pressures on locally-available coral reef resources. The dwindling populations of certain marine species (mainly highly-valued biota) such as the giant clam, sea-cucumber and coral fishes has jeopardised and will continue to jeopardise the sustainability of the local community. Innovative and practical ideas are needed to approach the problem by creating activities which can be expected to result in alternative sources of income generation.

4. There is lack of awareness about the ecological significance of coral reefs in some communities. Such ignorance has induced apathy towards preventing destructive fishing methods on the part of most individuals within most fishing communities, making the practices harder to stop.

5. The high demand from the international market for coral fish and other species has been the primary reason for the pursuit of high-yield harvesting of these resources; hence the application of illegal, destructive methods for an immediate high-yield and high-return result appears worth the risk of punishment for violating the law.

The problem here is the Risk Ratio between the threat of punishment, which too often is easily avoided, and the high price offered for the catch makes DFP irresistible. Furthermore, once initiated, the use of DFP sets up a positive feedback or 'vicious' cycle whereby, as the reefs are degraded by DFP, it becomes harder to obtain high yields through traditional non-destructive fishing methods, making and DFP ever-more attractive to obtain sufficient yield in order to satisfy the market demand.

6. The role of the *Ponggawa* (capital owner) remains strong and dominant, and therefore weakens the bargaining power of the *sawi* (laboured fishermen). Such a mode of capital management has a direct impact on the resource system in terms of the exploitation intensity, the fishermen's access to the market, and the fishermen's struggle to provide a regular income for their families. The dominant role that a *Ponggawa* assumes in the economy of coastal and small-island communities is damaging to the fishermen's efforts to achieve self-reliance and a self-sustained economy within their community.

7. The short-term economic gain that drives unsustainable modes of marine resource exploitation has, at the same time, caused other socio-economic problems in the coastal society of Sulawesi. To illustrate this, an example can be taken from Kambuno Island, one of nine islands within the Sembilan Islands group (Site 3). Here many of the locals took jobs as sea-cucumber divers back in the early 1990s. These people lacked sufficient knowledge of appropriate diving gear and methods in order to prevent hyperbaric and other dive-related accidents. The *Ponggawa* were concerned with quick capital returns; therefore many of the divers experienced occupational hazards during their dives to search for sea-cucumber, and subsequently suffered permanent physical disabilities (such as deafness, paralysis, and other neurological aliments) or even death. The social implication of this is that a certain part of society becomes unproductive. In one corner of the Kambuno Island, there is a small street known to the locals as widows' avenue, a name reflecting the sad fact that most of the inhabitants are widows who have lost their husbands, the primary breadwinners, to sea-cucumber diving accidents.

8. An absence of coordination and communication amongst resource stakeholders creates a situation which is vulnerable to the development and occurrence of conflicts of interests in resource utilization. When no one takes responsibility for

such a situation, it eventually leads to a condition that resembles Garret Hardin's illustration of the 'Tragedy of the Commons' as demonstrated by the open-access coral reef sites.

9. The inability of government to enforce tough measures upon those who destroy the coral reefs has created apathy in society. In realizing that they may not be able to do anything about the situation, the community members tend to channel their disappointment into grabbing or harvesting as much of the resource as they can while it still exists by taking part in further exploitation, which produces a progressively worsening situation or 'downwards spiral' of resource sustainability.
10. Weak and inconsistent law enforcement, such as in punishing violators, has been the reason for the government failure to uphold the law and effectively eliminate the illegal destructive fishing methods. Designated institutions with a mandate to overcome environmental violations as well as to enforce conservation measures are relatively weak and have poor capacity. It is necessary to build and strengthen the local institutions in order to lay a solid foundation for establishing an effective community-based management regime.

Pattern of interactions

The development of an understanding of the relationship between resources, resource users, and the economy created from this resource use is pivotal to examining the strengths and weaknesses of the system in place and for analysing or formulating alternative regimes. Theoretical elaboration of this has been discussed previously in Section 3.2.

The resource management system that is currently in place in the study sites, in general, has three entities as its main stakeholders: the State, the Community, and the Capital. Each of the stakeholders at one time is represented by individuals and an individual may also assume more than one stakeholder role. For example, a person may be a community member as well as an entrepreneur running a business venture, making him a representative of Capital as well as Community interests.

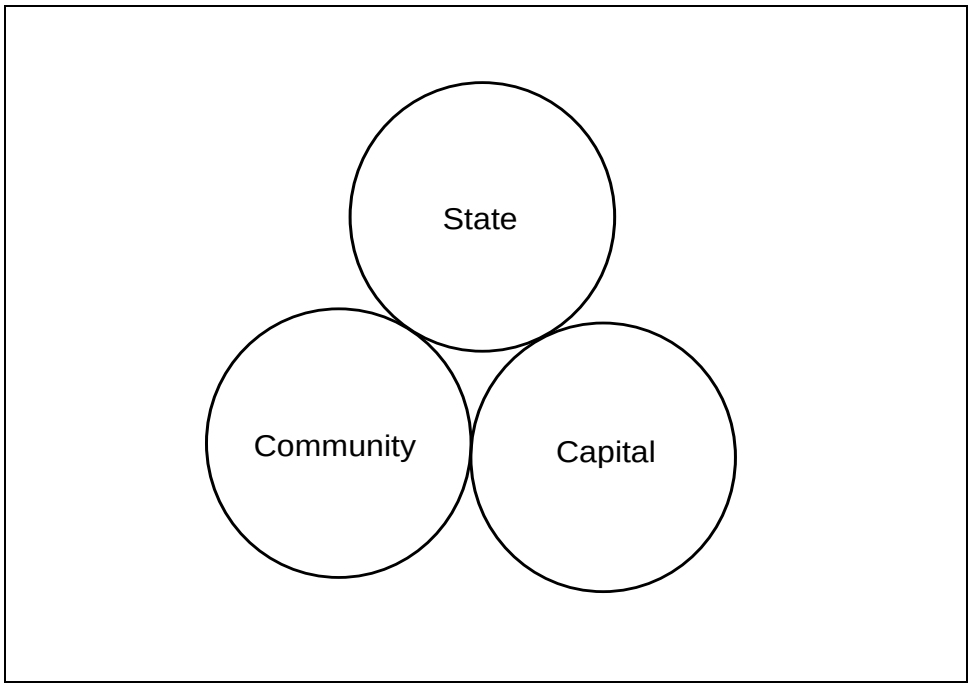


Figure 7.1. The three main stakeholders in natural resource appropriation depicted as the three crucial components of managing resources for sustainability. This diagram provides a generic situation where there is no interaction between stakeholders.

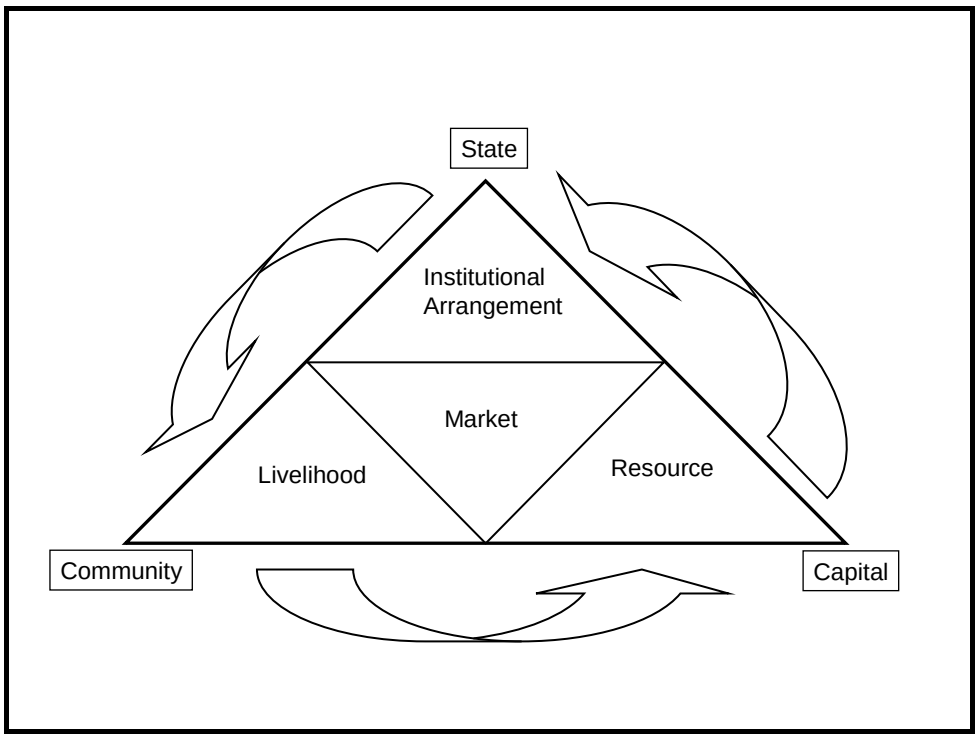


Figure 7.2. An integrated approach to managing relationships between the three main stakeholders in tropical coastal resource management, where Capital, State and Community interact and govern their interests over resources, their livelihoods and their access to the market through appropriate institutional arrangements.

Under a generic condition, as depicted in Figure 7.1, these three entities will maintain the balance of interests over the resources and therefore will play according to the rules and create no anomalies. However, in places where the level of corruption is rampant (see Chapter 5), rules are often bent and create a situation where collusion among the stakeholders are ripe. Capital – State collusion produces a situation like that which occurred in Lamurukung. A stakeholder can not only be collusive but can also co-opt another stakeholder. When the Capital co-opts the Community, it creates situation similar to the islands where DFP operators (*ponggawa*) live. On the other hand, when community co-opts the State the resource outcomes may be good or bad, depending on the nature of their relationship. It can either be Collaborative (positive) or Collusive (negative). Collaboration may create a positive and productive atmosphere which promotes sustainable resource management. Collusion can create resource anarchy, for example in the coral reef sites where small-scale fishers were conducting occasional blast-fishing and the security authorities did not investigate these occurrences due to lack of funding for their patrols.

Lowe (2000) provides an interesting description on how the global market pressures and the DFP brought about local injustices among the Togean Islands community in Central Sulawesi. Similar to this, Mulekom et al., (2006) address further about the market pressures that created export oriented trading of fisheries product in Southeast Asia, especially from Indonesia. They suggest that in addition to the trade relation being injustice, the market pressures have induced high intensity of natural resource exploitation which leads to environmental damages. An important link between their findings with this research is the identification of unequal relation in trading which leads to ecological and social injustice. In addition, this study addresses further the occurrence of collusive partnership, or even a collusive network of vested interests, that is working behind the stage, yet very powerful and is actually running the show.

In order to address the tendency for resource use systems to being collusive, Figure 7.2 provides an integrated approach where, instead of benefiting from being collusive, the stakeholders are motivated to collaborate to enhance the value of the market through improvement in the community livelihood, regulated access to

resources, and appropriate institutional arrangements including a legal framework to facilitate a fair and responsible interactions among the three key types of stakeholders.

7.5. LESSONS FOR RESOURCE SUSTAINABILITY

Like many other developing countries, Indonesia is struggling to meet its aspirations to improve the quality of life of its communities through economic development which is heavily reliant on its seemingly abundant natural resources. One of the many crucial challenges facing Indonesia today is the reconciliation of development objectives and conservation aims in the coastal and marine sector. In other words, the prospect for sustainability of coastal and marine resources in Indonesia is defined by the ability to strike a productive balance between resource extraction activities on the one hand and environmental conservation efforts on the other hand.

Official documents on sustainable development in Indonesia aim at the integration of the following two general objectives: 1) maintenance of ecological integrity and environmental thresholds with respect to vital ecological functions and values, and 2) feasible and controllable forms of resource utilization (GoI, 2005). Sustainability has progressed from a concept concerned solely with environmental and technical considerations to one where there is now a range of interpretations relating to the promotion of environmentally-sound approaches to economic development as well as socio-political institutional frameworks to support such endeavours. This more-complex view of sustainability is now a widely-acknowledged concept used by organisations representing all scales of governance: local, regional, national, international and global. The following subsection discusses issues of sustainability in terms of the three different vertical levels which interact to affect coastal communities in Indonesia: local, national and global. These are discussed in relation to the case studies' findings, with lessons to be learned drawn from them.

Sustainability at the local level

The use of destructive methods of resource utilisation appears to be essentially a locally-based problem, with impacts that are not necessarily local. Indeed, most of the observations of such activities revealed impacts far beyond local area boundaries.

The mangrove conversion into intensive shrimp farming facilities as observed at the Lamurukung (site 1) left environmental impacts well beyond the duration of the project and these impacts were experienced by communities even outside of Lamurukung village. Similarly, in Chapter 5 the DFP in the study areas generated environmental impacts which were often not locally contained, and the products of these activities were being consumed at sites far from the local area. The products from poison fishing, for instance, were meant for the export market, bringing a global dimension into the problem.

Addressing sustainability issues at a local level promises more success. Dahuri and Dutton (2004) pointed out that the involvement and support of local stakeholders is essential if site-based coastal resource management plans are to be implemented and sustained. This is based on the recognition that human activities are an inherent part of all ecosystem functions and that coastal issue, such as resource-use conflicts, habitat degradation and resource overexploitation, are all a function of how local people view and value their resources. Furthermore, it is almost impossible to understand the environment and manage coastal and marine resources without the involvement of communities who use the resources and live and work in the coastal area. Local people are core participants in the resource-adjacent social community life and its economy, and thus they are stakeholders with interests in the sustainability of local resources.

Coastal communities are inevitably reliant on coastal and marine resources for their livelihood and survival. Studying both the livelihood activities of the coastal community and the ways in which the communities use resources and make decisions about their use is essential if we are to understand, formulate and implement ways of sustainably managing coastal resources. The collaborative approach to resource management is therefore important in assessing the arrangements of responsibility, authority and control over resources. This co-management paradigm advocates the need for more (quality of) community participation in coastal resource decision-making. This is in agreement with growing recognition of community's role in many success stories of local resource management (Jentoft, 2000; Wondolleck and Yaffee, 2000). Such systems of local advocacy have been founded in lessons learnt from bleak experiences of government-controlled, top-down resource management, as discussed previously in part 1. Indeed, past experiences show that many regulations, when implemented by the government without consulting or involving local communities,

eventually meets with only limited success at best or jeopardizes the local community livelihood at worst.

The case in Lamurukung (site 1) is an accurate showcase of such a failure. The decision to grant a concession to a Jakarta-based businessman to convert the 550 ha wetland in Lamurukung was done through lobbies in Jakarta, the capital city, more than 500 km away from Lamurukung, and most likely by those who had never even visited the village. Local people had no idea how the decision was made, had no background knowledge when the project suddenly appeared on their doorstep, and had no say at all when the project abruptly stopped. All the locals feel now is that this project has left them with a series of environmental problems to deal with and they were left on their own to 'clean up the mess'. On the other hand, the Tongke-tongke (site 2) case study provides a success story of how a local community took the initiative to address a pressing local environmental problem which was crucial to their own community life, and managed to mobilize themselves to secure their village land. Furthermore, they managed to transform the environmental challenges faced by their village into a source of livelihood and even pride for their society.

Sustainability at the national level

The use of destructive methods of resource utilisation is nothing short of an issue of sustainability at a national level. Although these methods took place in certain localities, they were nonetheless related to national processes and discourses. Mangrove conversion is a national forestry issue while DFP are a national fisheries issue - together they are within the national agenda of coastal resource sustainability. DFP activities and mangrove conversions both contribute significantly to the threat of over-fishing by creating habitat destruction and other derivative impacts. Unfortunately, the costs of unsustainable coastal resource exploitation are borne by all Indonesians while the benefits accrue to a selected few types of stakeholder.

It is now important for the national authority to address these problems in order to get Indonesia on the right track in managing its coastal resources and developing its marine sector. Dutton (2004) identified key requirements for Indonesia to meet in order to have a sustainable marine resource system:

- A need for better knowledge of the marine ecosystem, i.e. there has to be willingness to invest in understanding how the country's coastal and marine systems work.
- A need to build 'constituency', enabling communities to engage actively in decision-making about the resources they depend on.
- The need to 'learn how to manage', that is, building capacity at all levels (local, regional/provincial, and national).
- The need to build resilient networks of marine protected areas: to be fully effective, the national MPA plan needs to be nested within a national sea-use zoning system similar to the terrestrial zoning system that is widely used throughout Indonesia.
- The need for better targeted development assistance: that is, a more strategic perspective on opportunities for marine resource development.

It is clear from these identified requirements that Indonesia needs to enhance its capacity to deal with problems related to the Government's role in facilitating resource utilisation activities. Learning lessons from the bitter experiences of mismanagement of resources in many parts of the world and in many communities, it is clearly important for national governments, in formulating management regimes, to approach the problem through an appropriate process. To do so, the approach should be as comprehensive as possible and involve all the stakeholders. Such an approach should include political, economic and socio-cultural aspects.

- From a political point of view, it is important to generate policies that support small coastal communities. National government needs to show a political-will that clearly stands for poverty elimination and community empowerment. This can subsequently be followed by local government, which then strengthens its commitment to support small communities and the sustainability of their environment instead of getting lost in decentralization debates that serves only for negotiating politicians' interests and power shares.
- An economic approach is needed to improve the access of small communities to the market and to productive assets. Local government needs to provide infrastructure for remote coastal areas and small islands, such as facilitating the provision of small-scale capital to empower small-scale shrimp farmers and small-boat fishermen.

- Socio-culturally, there is a need to reinterpret and revitalize local wisdom and coastal community culture (*budaya bahari*) as the basic character of maritime society in an archipelagic state like Indonesia. Universities and NGOs should play a lead role in this process by enhancing their community outreach, participation and co-learning programs.

Sustainability beyond the national sphere

Addressing the issue of sustainability at a global level may sound over ambitious. I argue that this issue must, however, be addressed based on at least two reasons: the market demand goes beyond national borders *and* the environmental impacts are also interconnected up to global levels. There has been several studies addressing the issue of sustainability at a global level (e.g. UNCED, 1992; Cicin-Sain and Knecht, 1998; Kay and Alder, 1999; Bell *et al*., 2006). Effort at this level has revolved around the question: how can society's complex economic activities be facilitated to, at the same time, minimize any negative impacts of these activities so that economic development can be sustainable? In other words, studies and activities at this level try formulating mechanisms and approaches to be able to continue resource uses and extractions at a rate which is beneficial while, at the same time, maintaining the renewal capacity of the resources. The formula developed should be as simple as possible so that it can be applied in many areas. So far ICM has been at the forefront of this effort and has been promoted in many countries through multilateral development agencies such as the World Bank and the United Nations derivative organisations, together with particular countries development agencies (e.g. USAID and AUSAID).

Nevertheless, experience shows that it is almost impossible to provide a 'one size fits all' type of formula to apply at once to many communities, never mind many countries. Furthermore, looking at the indication of how ICM works and being replicated in many developing countries, Nichols (1999) criticises ICM regimes as opening up coastal zones worldwide to aggressive state and global capital investment, facilitating resource access for modern economic interests, which then induce the overhaul of existing social and spatial patterns of organisation in coastal areas.

Also, at this global level the emergence of civil society can have a significant contribution by providing alternative mechanisms to deal with resource problems at

the local level using world-class expertise. These organisations include the International Coral Reefs Initiatives (ICRI) and the Global Coral Reef Monitoring Network (GCRMN) with their quadrennial International Coral Reefs Symposium (ICRS), the Ramsar Initiatives for wetland environments, the IUCN and other environmental NGOs such as WWF, Friends of the Earth. In addition to this, I perceive from my case studies the need to work at a regional (multi-national) level to provide a bridge between national and global levels. Current examples of this include the multi-lateral cooperation in Oceania and in the Southeast Asian region. The most recent initiative on this is the launch of the Coral Reef Triangle Initiatives (CTI), an initiative to bring more attentions and political will for the six countries in Southeast Asia and Pacific, whom together owns more than half of the world's coral reefs, to collaborate for coral reef sustainability.

After spending four years studying this particular subject, plus over a decade of my involvement in tropical coastal resource management in Sulawesi, where I interacted closely with coastal fishing communities, I have come to realize that there is no one 'best solution' to the dwindling resource problems faced by coastal communities. Thus, there is no such thing as a 'panacea' to offer as an overarching solution to the coastal resource utilization problems of Indonesia. Most likely, every resource problem presents a unique case which will need particular approaches that will need us to evaluate and examine the characteristics (stakeholders, dynamics, sustainability issues) of the problems closely, getting involved with the local community facing the problem, interacting with several levels of authorities, identifying the pros and cons and weighing the alternatives before generating most comprehensive solution that is possible.

CHAPTER VIII. CONCEPTUALISATION AND CONCLUSIONS

8.1. INTRODUCTION

This study was motivated by the paradoxical facts that Indonesian coastal communities are often resource rich but income poor. Furthermore, despite efforts to improve coral reef and mangrove management in Indonesia, these coastal resources remain under threat from anthropogenic disturbances and are continuously deteriorating. The main research question in Chapter 1 states that "*if the local resources are important for the livelihood of the local people, then why do the locals continue destroying these resources, often to a point of complete annihilation of the resources*". This research question is then followed by nine more derivative questions. Empirical findings presented in Chapters 5 and 6, and further synthesis and analysis in Chapter 7, establish that the answer to this main research question is not a clear-cut situation. Far from being simple, the causes of coastal resource destruction in the study sites have their roots grounded in many aspects of coastal livelihood and within the many levels of resource management.

Building on from earlier chapters, this concluding chapter presents a conceptualisation which attempts to point to a way forward – that is, a possible framework for achieving sustainability in coastal resource utilisation. Policy implications of the research findings are also identified. In concluding the thesis, it is also important to set the record straight on the limitations of the research and, hence, identify the further research that is needed. Finally, being the last part of the thesis, an overarching concluding statement is offered on the outcomes expected from this study and the way forward for Indonesian marine resource management in general.

8.2. ALTERNATIVE SCENARIOS TO ACHIEVE SUSTAINABILITY

This thesis concerns the question of why the use of destructive methods of natural resource appropriation has been the main feature of resource management in developing countries like Indonesia. In Chapter 7, I summarised and analysed the strengths and weaknesses of the management regime currently in place in Indonesia via two detailed and field-based case studies. I identified key areas where problems

are significant and improvements are urgently needed, and charted the threats and challenges ahead for coastal resource development in Indonesia based on understandings gained during the research process. The main research question has evolved with these new understandings. In this section I seek solutions to the destruction of coastal natural resources taking into account the finding that the locals who are apparently performing this destruction are just one link in a complex web of stakeholders, investors and consumers driving DFP, mangrove conversion and, ultimately, coastal ecosystem degradation.

A model for a better management, and subsequently a more-sustainable resource system, is presented here. Discussion is based mainly on two diagrams, which depict ideas around coastal resource sustainability which have been generated from this research. Figure 8.1 presents a theoretical synthesis to describe the dynamic couplings of natural and human aspects of the coastal resource utilisation system, based on the empirical findings from the field. Following from this, Figure 8.2 presents a diagram describing the processes involved in generating a sustainable resource utilisation system.

In Figure 8.1 I have developed a conceptual framework of an integrated model of resource utilisation in coastal areas. It is designed to synthesize the interdependence amongst environmental, economic and socio-political aspects of the utilisation of coastal resources. This model captures the important components at work in the two case studies detailed in Chapters 5 and 6. The idea of this diagram is to present the process whereby sustainability can be achieved within each subsystem, which then can translate into sustainability of the whole system. It is an open and dynamic system, whereby the interactions amongst the system's components are adaptable to their changing dynamics. The diagram shows how sustainability is defined in each of the subsystems which, through the interactions illustrated, makes up the whole system of resource utilisation in coastal areas.

The model's three subsystems are: bio-physical, economic and socio-political subsystems. Each subsystem has its own dynamic and, at the same time, is interdependent on the others. Each of the three subsystems represents a particular aspect of the model. The biophysical subsystem represents the state of the environment where the resources are embedded. The economic subsystem serves to represents the processes involved in utilising the resources, and the socio-political subsystem represents the ideology that inspires the resource distribution mechanism.

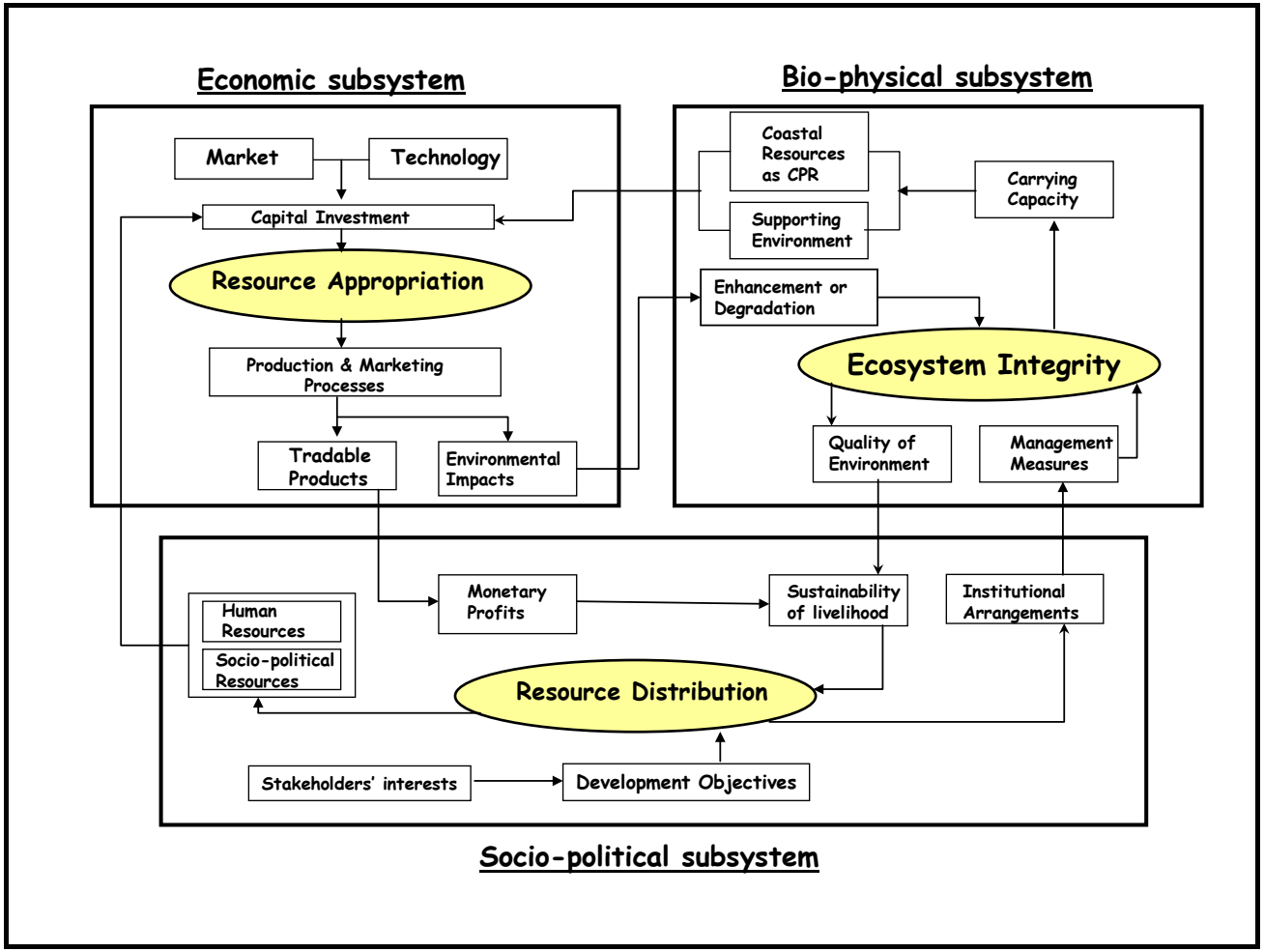


Figure 8.1. An integrated coastal resource utilisation model for generating sustainable livelihoods in coastal areas. The model is a theoretical synthesis describing the dynamic couplings of natural (environment) and human (socioeconomic) aspects of coastal resource utilisation, based on empirical findings from the field.

Bio-physical subsystem

The central feature of the bio-physical subsystem is ecosystem integrity. This mainly refers to the state of the environment in which the resource is embedded. State of the environment may change based on its interaction with other subsystems. It may change, for worse or better, due to resource appropriation processes in the economic subsystem, which produce environmental effects that are, in turn, absorbed into the ecosystem, depending on the direction of changes, as an enhancement or degradation. Theoretically, the economic system requires the environment system on at least two levels: as the source of material inputs, and as the sink for refuse and by-products. In many of the cases reviewed in the literature of this thesis and in the mangrove and coral reef field studies, the environmental effects of development of the economic subsystem has produced environmental degradation where this has occurred in developing countries settings.

The other side of this subsystem's interactions with the whole system is the management measures implemented by institutional arrangements from the socio-political subsystem. Management measures are a means employed to maintain the ecosystem integrity in its best possible state in order to serve two main purposes: to maintain the carrying capacity of the environment, which defines the availability of resources, and to enhance the quality of the environment, which will define the sustainability of coastal livelihoods. Drawing from the empirical findings of this study, the biophysical subsystem 'supplies' coastal resources into the economic subsystem as well as the state or quality of environment into the socio-political subsystem.

Economic subsystem

The main feature of the economic subsystem is the resource appropriation process which includes exploitation, extraction, utilisation and cultivation processes. In the coral reef case study, for example, the appropriation of resources took place in the form of extraction of reef fish through blasting or poisoning methods. In the mangrove case study resource appropriation took place in the form of mangrove conversion to shrimp cultivation facilities. Inputs from the biophysical subsystem, along with inputs from the socio-political subsystem, into the economic subsystem are

a part of the capital investment process. Inputs into the economic subsystem come in the form of raw materials from the environment as well as human and other socio-political resources from the socio-political subsystem. This latter input is a key factor to take account of and one that is not realised in the original thesis research question. In addition to these inputs, market and technology aspects are input into the capital investment process. However, market and technology are considered independent variables within this model. Market and technology adopted into the investment process represent strong external interferences which are beyond the control of this system, thus they are affecting the system but considered to remain as independent factors.

The input of market and technology into to this economic system was observed in both case studies. In the coral reef case study, the relatively-high market demands could be seen to have dictated the intensity of resource exploitation, leading to a search for the most-efficient fishing methods and, ultimately, to the application of blast and poison fishing. Blast and poison fishing are considered more efficient technologies to meet the market demand. A similar setup can be observed in the mangrove case study. The relatively unsaturated international shrimp market cannot be satiated with the shrimp supplied from traditional marine catches. Therefore, shrimp aquaculture products are highly sought after. In turn, this induces the application of intensive technologies in aquaculture. Again, technology is employed to meet market demands.

The processes of production and marketing in the economic subsystem, on one hand, produce the tradable products for market consumption yet, on the other hand, generate waste, pollution and other by-products which do not enter the market but rather go back into the biophysical subsystem. Furthermore, the resource appropriation process itself changes the resource environment. All these process interactions produce environmental impacts that may enhance or degrade the ecosystem. The tradable products from the economic subsystem generate monetary profits which enter the socio-political subsystem.

Socio-political subsystem

The main feature of socio-political subsystem is the ideology that works behind the resource distribution process. This ideology inspires the process of resource allocation. The process starts from the interests of stakeholders being accommodated in to the development objectives. This may take place in a democratic process such as through general elections followed by debates in legislative chambers, or it can take place through other means of power relations such as decisions from authority, pressure from lobby groups or other ways of settling different interests. In any case, once the interests are adopted into the development objectives they then become the basis for the resource distribution mechanism.

The resource distribution mechanism is the implementation of ideology or, at least, a paradigm set forth in the development objectives. This mechanism generates the governing system for natural resources through a set of institutional arrangements, policies and legal frameworks which are responsible for enforcing the necessary management measures to maintain ecosystem integrity. On the other hand, the resource distribution mechanism also addresses the importance of human resources and other, socio-political resources which are needed as an input into the economic activities. This includes, for example, the provision of education and health services on remote islands or other poverty alleviation programmes.

The response from the other subsystems comes in the form of monetary profits or losses and the improvement or deterioration of the quality of the environment, which then feeds into the state of the sustainability of coastal livelihoods. This reflects the acceptance of society of the current mechanism for resource distribution. The mechanism may change due to changes in society's state of livelihood or due to changes in the stakeholders' interests.

In retrospect, the most important part of this model is the integration of all of the three subsystems into a dynamic system of coastal resource utilisation. There are six interactions between the subsystems which link and join them together as an integral system. Each subsystem has inputs as well as outputs into the other subsystems. These links ensure that processes in one subsystem define and are determined by the dynamics operating in the other subsystems - hence an integral system. However, this is not a closed system and, therefore, it is susceptible to

external forces. External interference may come in through market and technology inputs or through representation of the stakeholders' interests.

A good understanding of the dynamics of the coastal resource utilisation system as can be explained using the Figure 8.1 model is the basis for conceptualising a mechanism for generating sustainable resource utilisations. This model is offered as a generalised concept from which a primary mechanism for generating sustainable resource usage can be established. The following diagram illustrated in Figure 8.2 explains this process. From my field experience I realise that, admittedly, it is perhaps impossible to guarantee the success of a concept. Nevertheless, a concept is needed as a preliminary starting point to guide the process of establishing a standard mechanism and to identify how much the process has gone astray from the purpose of supporting sustainable coastal livelihoods. The concept is therefore not to be taken on board wholesale and dogmatically but rather is to provide inspiration for working to achieve results beyond what can be seen in coastal Indonesia at present.

The main idea of Figure 8.2 is to describe the process needed in generating a sustainable resource utilisation system. Two important aspects needed to generate a sustainable resource utilisation are that (1) it adheres to a set of sustainability criteria and (2) it is guided by appropriate policies and institutional arrangements. Sustainability criteria are a set of parameters defined through a systematic, objective and reliable process. Although inherently cultural in its conceptualisation (Mather and Chapman, 1995) such a process is mainly a scientific process, although there are occasions where empirical data may not be available and, thus, there is a need to rely on other best-available methods.

Drawing from the case studies, sustainability criteria can be categorised into four sustainability aspects: economic, ecological, social and institutional. These can be further defined based on two important characters: the resources and the users. The resource characteristics represent the state of human knowledge about the resources. To achieve sustainability we need a solid understanding of the resource in question. This is especially true for the bio-physical and ecological aspects of the resources. On the other hand, the users' characteristics are represented by information that captures the current dynamics of the users of the resource such as demographic data, socio-economic, political and cultural aspects of the community as well as of the resource stakeholders.

The dynamic of the resource utilisation is affected by two important types of forces, the exogenous and endogenous forces at work in society. The exogenous forces are the changes in external environments that are beyond society's reach to control. Exogenous aspects are mainly represented by changes in the market structure such as the changes in the balance of supply and demand, consumers' preferences or production costs. Another possible exogenous factor is global changes in climate.

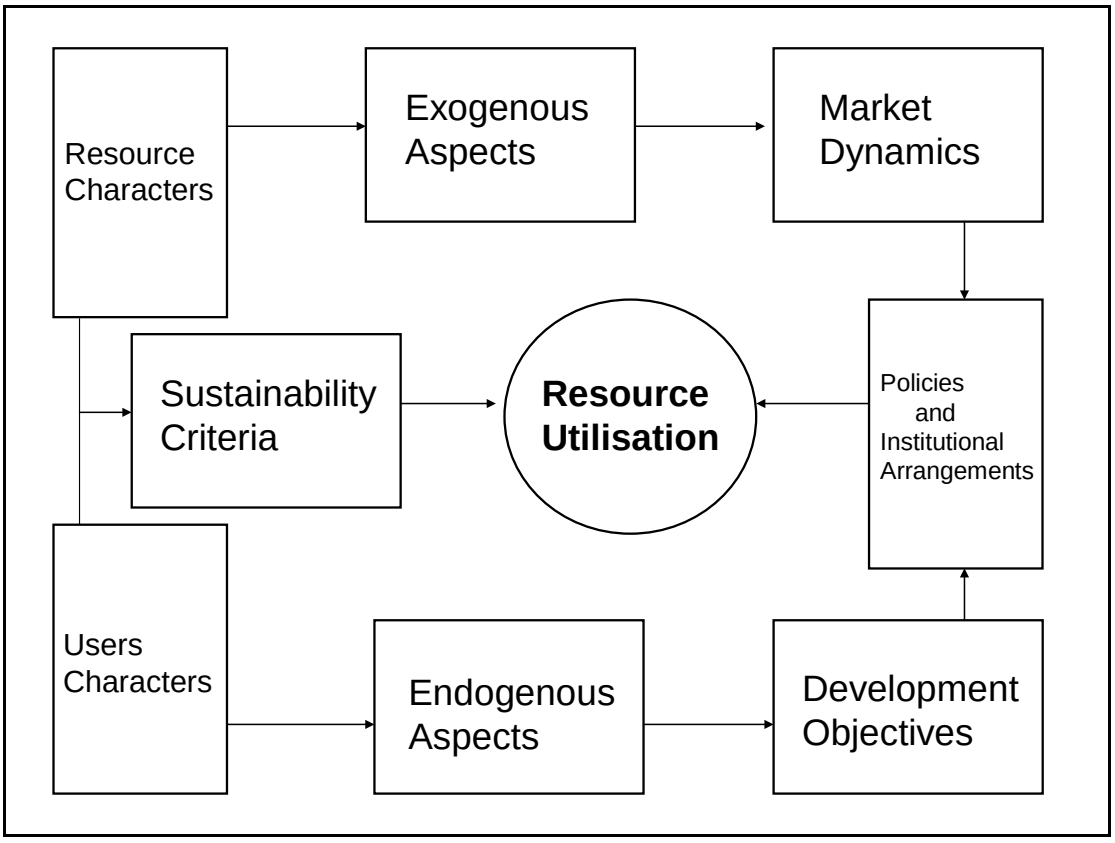


Figure 8.2. General conceptualisation for a sustainable use of coastal resources. The diagram describes the process needed in generating a sustainable resource utilisation.

The endogenous forces are those that influence resource utilisation based on aspects sourced from within the society. These endogenous forces become the basis for defining the development objectives generated by the state. Theoretically, the development objectives in Indonesia are defined and drafted in legislative chambers by members of the legislative branch of the state. The legislative members are elected directly by people and, as such, are supposedly representative of the people's desires.

Policies produced by government are in response to the dynamics of the market. Some of the government policies are in direct response to the market

situation, such as the ban on trawling by the Indonesian government in 1980 or the decision to allow certain types of corals to be sold or, as in Chapter 6, the government policy on cash crops. Two important instruments for government to manage its natural resources are policies and institutional arrangements. Therefore, in order to govern natural resource utilisations sustainably, the Government produces policies and sets up institutional arrangements based on three key factors: the prescribed development objectives; as a response to market needs; and in reference to the sustainability criteria of the resources.

The challenge for the management regime is to address the changing interests and interactions amongst the stakeholders, to be resilient and at the same time as being adaptable to these changing situations and to produce the required benefits. A good management regime, therefore, is one that is capable of absorbing the dynamic changes coming from exogenous and endogenous forces and of realigning itself with necessary changes, while always maintaining its capacity to generate the required benefits and maintain resource integrity into the future. This insight is quite consistent with other resource management studies that describe the importance of institutional capacity in addressing the management challenges (Ostrom, 1990 and Ostrom, 2005). It has also been observed to be an important feature in many resilient resource management institutions (Baland and Platteau, 1996; and Agrawal, 2001), including those dealing specifically with coastal resources (Brown *et al.,* 2002 and Christie *et al.*, 2005).

In retrospect, it is therefore important for a resource manager to understand the dynamics of the criteria in order to generate a sustainable resource utilisation. The resource utilisation itself is a dynamic process which needs to respond to the changing constellation of interests and situations. Despite all the constantly-changing situations which dictate that the resource management process must reconfigure and readapt, the idea behind managing resource utilisation stays the same: to produce the best possible benefits at present while maintaining the future capacity of the resource to continue to generate necessary benefits. This future-proof aspect of resources was famously described by the Brundtland Commission (WCED, 1987).

8.3. POLICY IMPLICATIONS OF THE RESEARCH FINDINGS

This study has important implications for discourses on natural resource management policy and research. Empirical insights from this study will enrich the body of knowledge addressing problems of sustainable development in coastal areas, and contribute to the provision of appropriate formula for responding to the developmental challenges faced by developing countries in managing their coastal resources in a sustainable manner. The research provides a synthesis of how past experiences of the strong top-down approaches in resource policies have impacted on current practices of natural resource utilisation in coastal areas. This, in turn, determines future approaches to coastal and marine resource governance regimes. In practical terms, the lessons learned from this study can enhance the planning and decision-making mechanisms for sustainable use of coastal resources.

It has been shown throughout this thesis that government has the top-level role in the management of coastal resource, especially in the context of Indonesia where society have had a prolonged period of authoritarian rule as well as a socio-cultural context which attributes important roles to the authority. Figure 7.1 in Chapter 7 shows the importance of government as one of the three main stakeholders of the resources. The policy implications presented in this section should be seen not only as recommendations but rather more as opportunities for government to advance its role in, and improve, the coastal resource management regime. The areas needing to be addressed can be categorised into five areas: 1) enhancing local-community and management authority capacity building; 2) accelerating poverty alleviation; 3) supporting local management and sustainable-use initiatives; 4) addressing the collusive network; and 5) adopting consumer power.

The most important and urgent task for government is to enhance its capacity building. One particular theme that occurred throughout all of the study sites, in every resource problem, was the lack of legal compliance and the inability of the formal institutions to effectively enforce the law. This inability to enforce the law is at the cores of the corrupt behaviour that is widespread amongst many government officials and officers. The coral reef case study detailed in Chapter 5 indicates clearly that this corrupt governance is an important reason behind the persistence of DFP. Whereas the mangrove case study findings in Chapter 6 also indicate that government-private capital collusion is closely related to corrupted governance at an even higher level.

These two important aspects need to be addressed first, before other factors can be discussed. After this, the next issue to address is to enhance the institutional arrangements related to coastal resource management. This includes organisational enhancement, facilities improvement, and completing the legal frameworks.

On a positive note, government may be applauded for having the 'National Act for the Management of Coastal Areas and Small Islands' (Act No. 27 of 2007). Despite criticism that the Act is commercially oriented and lacks community orientation (Karim, 2008), it should be recognised that it represents an important step in coastal resource management. The Act was delayed for more than five years in the Legislature due to the many conflicts of interests held by stakeholders concerning the scope of the Act. Its eventual inauguration represents an important early step towards a more-comprehensive resource management framework and provides the required certainty and assurance in the legal landscape of coastal resource development. In the context of addressing DFP and other destructive methods of resource utilisation in coastal areas, this Act should be used as the basis for justifying systematic efforts to combat these activities.

The second policy implication aspect of concern is the need to address and accelerate poverty alleviation in Indonesia, particularly in local coastal communities. The current government in office has run a national poverty alleviation program from 2004 to 2009. Data show that fishermen, especially the *sawi* and especially those living in remote islands settings, are amongst the poorest of the poor in the country (Dahuri, 2003). It must be recognised not only that poverty alleviation in coastal areas is important but moreover that it is important to accelerate the alleviation process if we are to safeguard remaining coastal resources and livelihoods. It is important to improve fishermen's welfare through the fulfilment of basic needs in order to avert the use of DFP for economic reasons. The empirical findings of this research indicate that, to some extent, poverty forces fishers to apply DFP, which are either imposed by their patrons (*ponggawa*) or by choice due to efficiency and lower-costs reasons. DFP applications have been shown to improve their current short-term living standards. On the other hand, fishermen who were unable or choose not to use DFP were shown to be relatively poorer than their associates.

The third agenda arising from this research in terms of policy implications is the need for government to support local initiatives. It has been shown that government support is just as important as the local community bottom-up initiatives

(Agrawal, 2001) as seen in Tongke-tongke (Site 2). Experience from Tongke-tongke shows that an important part of the local community's success in maintaining their conservation effort was the government support and recognition of their cause. Such support can cement local-community rights of use and exclusion, further encouraging them to protect resources over which they now feel they have some control and ownership. Other local initiatives from other sites where government involvement was minimal or nonexistent showed that such initiatives soon lost steam, failed and faded away. Therefore, an important step that government can do is to adopt the idea of co-management into the legal framework. Unfortunately this idea has not been accommodated, even in the new coastal Act (Act 27 of 2007). Community empowerment was mentioned only in one verse of this Act. It does not address the bottom-up initiatives by community, or even co-management. This will be an important input when the Act is due for review.

A related issue is the lack of the sustainability concept found in project-based types of MPA initiation. The case study in Chapter 5 shows that despite the different successes achieved in operating local MPA, even the most-successful MPA stopped operating after two years due to running out of funds. This is because all three MPA were initiated as project-based MPA. Once the project is finished or the money runs out, the MPA stops operating and, thus, is not sustainable. Another important issue concerning this theme is the importance of the government in addressing the property rights issue. For example, one obvious reason for people in Tongke-tongke (site 2) to plant mangroves is the benefit of being able to claim the trees once they are growing. It is important for the government to recognise this and to endow proper property rights to the appropriate stakeholders.

Upon completion of the three important aspects above, the government can start directly targeting the collusive network. It appears that once the issue of poverty in coastal areas is alleviated, DFP operations will lose their field-operators. Furthermore, when an effective institutional arrangement is in place, corrupt governance can be expected to stop or at least become less the *modus operandi* and DFP operations will lose their security providers. Without having the three prerequisites discussed above in place, targeting the collusive network by catching the odd field-operator from time to time is just a waste of resources - time, money and personnel. I have found that it is important to dig beneath the surface, where most the earlier assessment stopped in their simple blaming of field operators. As addressed in

Chapter 7, the complex relationship between the capital, community and the state needs addressing to solve problems with access to and appropriation of resources. It is important to create mutually-respectful, non-exploitative, and beneficial relationships amongst these three main types of stakeholder.

The last item on the agenda is for government to adopt a 'consumer power' approach. This is an approach that relies on market differentiation between products based on how the consumers view or appreciate a particular type of product (Jaquet and Pauly, 2008). This can be done through the application of different prices for sustainable versus DFP sourced fish. It can decrease the current imbalance between fish prices and production costs for fish caught through DFP versus sustainable methods (or at least non DFP), and even create a new imbalance of costs versus income biased towards sustainable catches. Differentiation of the prices of fish caught by DFP can offer disincentives for their application. Similarly, the high production costs of destructive gear may deter fishers from applying DFP. A similar idea can also be introduced for shrimp products (Hutchinson, 2005). There can be market differentiation in shrimp, such as organically or traditionally farmed shrimp. Another method of market differentiation is through the use of green labels and other types of sustainable certification, among others, organic certification, ecologically viable products, minimum foot-print products, socially-responsible products such as fair trade.

Finally, as indicated in Chapter 1, Indonesia is currently undergoing a process of decentralisation. It is important to address this changing regime in the national policy of natural resource management. This condition provides unique opportunities as well as challenges in terms of political as well as practical implications in relation to coastal resource management. First, it is clear that there is a need to re-evaluate all the rules and regulations regarding natural resource management decentralization in such a way that they do not contradict each other. This is an important step to avoid ambiguity while society evolves to embrace the idea of decentralization. In relation to this, there is also an immediate need to define the evolving roles and responsibilities of stakeholders and how they can participate meaningfully in a decentralized resource management regime. For example, the roles of central and local government need to be made explicit and transparent to avoid vertical conflicts. It is also crucial to define how stakeholders at the local level, such as local communities, private enterprises like *ponggawa* and NGOs, can participate constructively in a context of local autonomy. It

is necessary to ensure that stakeholders at the local level give their full support to a new decentralization process and also that they are actively involved in protecting the coastal resources.

8.4. LIMITATIONS OF RESEARCH AND FURTHER RESEARCH NEEDED

Notwithstanding the significance of the results of this research, some limitations should be recognised and taken into account when interpreting and implementing the findings. Scientific endeavour is basically a constant process of enrichment towards a body of knowledge through the emergence of novel understandings of why and how things work. It is important to recognise the limitations inherent in any research in order to keep this continued advancement of knowledge in progress. Limitations apply to this study in at least two areas: the scope and content of the research, and the methodology.

This study has endeavoured to unravel the complexity behind the persistence of destructive patterns of coastal resource utilisation. It identified the actors, direct and indirect, who employ different *modus operandi* for utilising different resources, and explained the reasons for the persistence of the destructive types of such activities. The study also further analysed the relationships amongst the stakeholders who assume important roles in coastal resource utilisation and, eventually, offered a concept that can be used to work towards generating a sustainable use of coastal resource utilisation.

Nonetheless, practical solutions to several of the problems identified in this thesis are beyond the scope of this study. While this thesis manages to disentangle and explain the 'why' questions, it has left some of the 'how' questions unsolved. The most important among these relate to DFP and to the continued decline of mangroves due to conversion to shrimp farming facilities. Although there is discussion in the thesis of theoretical approaches to addressing these problems, the practical step-by-step way to resolve them is just beyond the scope of this research. Some other limitations were also discussed earlier, in the previous section on the subject of policy implications, and areas considered to hold potentially-significant answers to advance our knowledge in areas relevant to the objective of this thesis are recommended for further study.

A number of methodological problems should also be mentioned here. These relate to the fieldwork, data collection, analyses and data presentation. The nature of this research, investigating illegal activities such as blast and poison fishing, has taken its toll on the availability of information and the willingness of respondents to talk openly. It takes considerable amounts of time to build a good rapport and trust with the people who are potential sources of information and to convince them to participate and provide evidence. While collecting data from the first layer of the collusive network – the field operators – was nowhere near an easy task, accessing the next layers – the higher-up actors – was unquestionably a much-more complicated mission.

A similar situation was faced when researching the issue of mangrove conservation. Investigating the success story of mangrove replantation was relatively easy since everyone loved to talk about their success. A very different situation was faced in the case of mangrove conversion, which involved a privately-owned company and certain players within government. As I experienced this process, access to the higher-level stakeholders in order to gather evidence on the collusive network formed around the mangrove conversion process proved to be no easy task. This condition presents particular challenges in terms of data verification. For this reason, the gathering of quantitative data on some issues was not possible.

It is noteworthy to point out here that sound findings depend on a sound research design and this is even more important for research based on case studies like this. It is necessary to provide an appropriate design – in advance – for case studies to work well. Whereas experimental researchers generalise from a sample to a population, case studies generalize an event or situation to a theory. The inductive nature inherent in case study approaches should not make us lose sight of the importance of the deductive approach. Combine both deductive and inductive approaches could help us gain a holistic perspective. Conducting ‘experiments’ to test the success of the models for sustainable coastal resource utilisation presented in Figures 8.1 and 8.2 will perhaps be a future step in my research endeavour.

A number of recommendations for further study can be derived from the current research. First, in terms of the future research agenda, it is recommended that there is a need to examine in more depth several of the areas uncovered by this study. Despite the many insights drawn from the present research findings, there are a number of areas which remain open for future research. The diagram presented in

Figure 8.1, for example, has many components that hold significant roles in defining the nature of interactions and processes in this dynamic of the system, but clearer understandings have yet to be made.

It is now paramount to improve our understanding of the dynamic relationships amongst the three main resource stakeholders identified in Chapter 7. A good understanding of the interactions between local communities, capital owners, and the government is an important step to progress toward resource sustainability. This will form a solid basis for further study on how to prevent the traditional patron-client system from becoming co-opted by market pressures. As indicated in Chapters 5 and 7, the *ponggawa-sawi* patron-client system has been co-opted by the collusive network of DFP. The ability to address this could help to turn the role of *ponggawa-sawi* into an alliance that represented a better agent of change in the coastal area. Along these lines, further research on the collusive network will help to explain more clearly the nature of Capital-State collusion in denying local communities rights to local resources as revealed in Chapters 6 and 7. This type of collusion not only occurs over coastal resource use but has also been observed as a particular pattern occurring with many types of natural resources (e.g. Resosudarmo, 2004; Tacconi, 2007).

My examination of current practices of coastal resource utilisation and their institutional arrangements suggests that it is necessary to conduct further research in order to answer the following questions: 1) how can the balance between government conservation objectives and the social and economic needs of coastal communities be achieved?; 2) how can the effectiveness of institutional arrangements in coastal areas be improved, especially those related to improving law enforcement and increasing legal compliance?; 3) what kind of property rights and what types of co-management arrangements can feasibly be implemented in this region?; and finally, 4) what kind of empowerment efforts are needed for coastal communities. This latter question includes sub-questions such as: what kind of alternative income generation can be offered to improve local communities' livelihood. This is certainly not an exhaustive list of future research agendas. Nevertheless, it provides an outline of the types of information and advances needed to move this region's coastal resource management system towards one of greater sustainability. Answers to these questions will be important in terms of the implementation of the three-prongs of sustainability in coastal areas: sustaining resource stocks for present and future generations, improving livelihoods, and enhancing the internal resilience of coastal communities.

8.5. CONCLUDING REMARKS

It has been demonstrated throughout this thesis that an array of competing demands and conflicting interests, coupled with ineffective institutional arrangements, are at the core of the problem of ensuring sustainable use of natural resources in coastal areas of Indonesia. The paradoxes presented at the start of this thesis are a simple manifestation of the reality that there is something wrong with the management of natural resources in coastal areas of Indonesia. My investigation of the roots of these paradoxes has led me to three important factors: a) the power relations among the stakeholders, b) the ineffectiveness of formal institutions, and c) the potential of local community to be self-reliant and to sustain their resources. These are the three key areas where attention is needed and improvements are required in order to produce a sustainable use of coastal resources.

I have found that there is a disconnection between what concerns most poor coastal-community folk and what gets the attention of the policy makers and decision-making authorities. This disintegration needs to be addressed and such preposterous practices as DFP and large-scale mangrove habitat removal need to stop. The circular causation and dynamic interdependence of economic, environmental and socio-political factors as depicted in Figure 8.1 needs to be understood and used as a basis for addressing the three problem areas mentioned above. Accordingly, the conceptual model established in Figure 8.2 offers a mechanism, including feedback processes and evaluation tools. It is designed for use in addressing the deficiencies within, and for reformulating, the current approach to making coastal resource management policies.

This study argues that local communities are at a disadvantage, disempowered, when confronted with the collusive networks targeting the exploitation of coastal resources. The empirical findings from this study strongly suggest that the existence of this collusive network is key to the persistence of the use of destructive methods of coastal resource utilisation. It is a practice that every logical individual who wishes to reside long-term in the local community will resist, yet it persists. In retrospect, I come to understand that the sustainability of natural resources depends on effective governance at several levels and, therefore, also needs to involve stakeholders at multiple levels. My recommendation is to promote a system of multi-scale governance that can link different levels within a management organisation, including the local

community, in order to promote their interaction and cooperation in establishing mutually-agreed common property access and appropriation rules and enforcement methods.

In the end, a mutually-respectful, non-exploitative, beneficial relationship amongst the three main stakeholders (government, capital owners and the local community) means an integrated development approach for addressing their access to, and responsibilities over, the resources. The very core of this endeavour is to strike a balance between the resource conservation objectives and the improvement of communities' livelihoods.

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